ABSTRACT

Title of dissertation: USE OF PRIVATE SUPPLEMENTARY INSTRUCTION (PRIVATE TUTORING) BY U.S HIGH SCHOOL STUDENTS: ITS USE AND ACADEMIC CONSEQUENCES

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The purpose of this study is to examine a rapidly growing educational phenomenon in the United States: *private supplementary instruction* (private tutoring). This instruction is offered out-of-school time, focused on academic subjects, and provided mostly for a fee. Its primary goal is to help students prepare for college entrance examinations (advancement), or address difficulties in academic subjects (remedial).

Using the concept of human capital as the primary theoretical framework, the study examines possible reasons for the use of private supplementary instruction and possible benefits that accrue to individuals from its use. The study examines if families with higher levels of educational aspirations or less academic satisfaction with their schools are more likely to use private supplementary instruction. It also considers

whether students who use supplementary instruction have higher gains in mathematics achievement or higher likelihood of college acceptance.

Data for this study come from the National Education Longitudinal Study and includes approximately 7,600 students who attended high school between 1990 and 1992. Students and parents were asked about the use of private supplementary instruction when students were 12th graders. Follow-up surveys in 1994 indicated students' post-secondary enrollment status two years later. Analyses of the use and effects of private supplementary instruction are calculated using OLS and logistic regressions.

The research findings indicate that families with higher levels of educational aspirations are more likely to use advancement supplementary instruction, and doing so improves students' chance of college acceptance. Advancement instruction may also improve the academic performance of students, particularly students from high-income families. Use of remedial instruction, however, does not seem to improve academic performance or the likelihood of college acceptance for most students, though Asian Americans and African Americans may be exceptions. Family income also appears to play a role in both the use and effects of private supplementary instruction.

Although human capital theory helps to explain specific aspects of private supplementary instruction, especially aspects associated with the use of advancement instruction, the study also demonstrates that issues related to use and effects of private supplementary instruction require additional theories to account for social and cultural factors.

USE OF PRIVATE SUPPLEMENTARY INSTRUCTION (PRIVATE TUTORING) BY U.S. HIGH SCHOOL STUDENTS: ITS USE AND ACADEMIC CONSEQUENCES

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For my husband, Akihiko Nishio,
Who has always supported me.

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CHAPTER I: INTRODUCTION

Parents often tell their children that they should study well so they can go to college, preferably a good college, and get a good job after graduation. Policymakers and business leaders often express concerns about the need for more skilled workers so that the country keeps thriving in this era of the technology-driven economy. When people are making such statements, they are consciously or unconsciously embracing the notion of *human capital*.

Human capital theory explains human behavior when people invest in themselves by getting more education and training with the aim of receiving a higher return on their investment in the future. Lately, one such educational investment seems to be clearly more visible and increasing in magnitude – the number of elementary and secondary school students who get *private supplementary instruction* (PSI) out-of-school-time. PSI is growing rapidly worldwide, such as in Australia, Britain, Greece, Honk Kong, Japan, Singapore, South Korea, and Taiwan (Baker, Akiba, LeTendre, and Wiseman, 2001; Bray, M., 1999; Ihlwan, 2000; "Private pursuits," 2001; Stevenson and Baker, 1992). It is also an emerging educational phenomenon among students in the United States. (Becker, B. J., 1990; Levine, 2000; Lombardi, 2004; Rusch, 1999; Snell and Anderson, 2000).

This study examines relatively unexplored issues of learning activities that take place outside school, i.e. PSI, through the lens of human capital theory. This chapter reviews the concepts of human capital theory; explains what PSI is; illustrates how such learning activities are expanding in the United States, and provides a conceptual

framework to broadly illustrate the current status of PSI in U.S. education. Based on that framework, this chapter specifies analytical models to empirically analyze issues related to PSI.

Human Capital Theory

Human capital theory, developed by Gary S. Becker, Theodore Schultz and others in the 1960s, states that just as people make investments in physical capital, they also make investments in themselves – human beings – through a variety of education and training experiences to increase their capability and efficiency as workers, resulting in greater employment opportunities and higher incomes (Becker, G. S., 1962, 1993; Langelett, 2002; Schultz, 1971, 1977). Human capital theory assumes that individuals make a rational decision on what to invest in after weighing the costs of such educational experiences and expected future benefits (Langelett, 2002). Education is the most important component of human capital (Schultz, 1993).

While such an investment is made at the individual level, the formation of human capital is viewed to have consequences not only for individuals but also for society as a whole. Individuals invest in human capital in hope of higher future income or more prestigious jobs. Such individual actions improve the overall quality of the labor force, as their skills and knowledge are enhanced through education and training, which leads to an increase in economic productivity and economic growth of the country (Becker, G. S., 1962, 1993; Cohn and Geske, 1990; Langelett, 2002; Schultz, 1971, 1977; Weisbrod, 1971). This is why governments and those who are concerned with economic growth often view the formation of higher qualities of human capital as an important policy issue.

Benefits by educational investments are also not limited to economic terms: by producing more educated citizens, the community to which they belong and society as a whole receive the external benefits that are due to educational investment. For example, the benefits include enhanced literacy, which improves communication among community members; more participation in activities to promote democracy; and improvement in the overall safety and health of the community (Cohn and Geske, 1990; Weisbrod, 1971).

In this regard, investments in people are public investments, since benefits accrued are not limited to individuals who have invested in education and training, but also to the society as a whole. That is a reason why communities often support the educational investment of their members. For example, the National Association for the Advancement of Colored People (NAACP) offers scholarships to minority students so they can have access to post-secondary education. The principal mission of Historically Black Colleges and Universities (HBCUs) that were established before 1964 has been to serve African-American communities and provide their children with quality post-secondary education.

In his well-known book, *Investment in Human Capital* (1971), Schultz states that there are five categories that can improve human capabilities, resulting in higher quality of human capital: health services, on-the-job-training, formal education (K-12), adult education, and migration to seek better employment opportunities. Undoubtedly these five are all important factors that can contribute to the development of human capital, but I argue that there is one important activity that is not listed here: out-of-school-time learning activities during the formal education period – activities that are often labeled in

different ways such as supplementary instruction, tutoring, extra lessons, after-school academic programs, supplemental educational services, academic coaching, and shadow education. As explained later, there is growing evidence that such learning activities are on the rise in the United States.

PSI

In this study I would like to specifically focus on the learning activities that I call PSI.[1] Among various learning activities that take place outside school, PSI refers to supplementary *academic* instructional programs that are provided *for a fee* by individuals or firms, and can be offered in a variety of formats such as individual or small group tutoring, preparatory courses for college entrance examinations held at local centers, or correspondence courses using traditional mail and internet services.

While some students spend their time after school attending *non-academic* activities, such as sports, music, or art education, or academic activities that are provided *for free* (tuition-free) mostly at their own schools including tutorial programs for remedial or college test preparation, I would like to primarily focus on *private supplementary* instruction for three reasons. First, *private* here means that instructions are provided by private vendors (individuals or firms). In my study it also means that instructions are purchased privately (by families).[2] Therefore, parents usually have to bear the cost of such learning activities, which means that they are willing to *invest* their resources to get

[1] As explained later, PSI programs have mainly two types of academic goals: (a) to give students academic advantages compared to their peers, and, for high school students, to improve the chance of getting into better colleges (advancement type PSI); or (b) to help students who have learning issues to overcome difficulties and improve grades (remedial type PSI).

[2] As shown later (see Table 1.3), some PSI is offered by private firms but financed at least in part non-privately, as families get financial assistance from the government or third parties to purchase such instructions.

an aimed outcome. Such investment action in learning opportunities seems to fit particularly well in the theoretical framework of human capital theory.[3] Second, there is evidence that the use of PSI is expanding and people are paying more attention to such learning opportunities in both the public and private spheres. Third, despite the growing interest in PSI among various stakeholders in education, such as parents, policymakers, and providers of education services, the research on the effect of PSI on student outcomes is very limited. Because this growing, non-formal type of education may have important policy implications, including implications for educational equity, it should be examined carefully (Cohn and Geske, 1990). The next section examines how the interest in PSI has been growing.

Growing Interest in PSI

The interest in private tutoring[4] has substantially risen, both among families and providers, where such interest is further fueled by the latest educational initiatives launched by the government, particularly the Bush administration that has controlled the executive office since 2000.

Popular Interest

One indicator of such a rise in interest is that the coverage by general media of this topic has been substantially increasing, especially since the 1990s, which indicates that public interest or awareness of PSI is also on the rise. A simple search using the

[3] In some instances, public schools offer tutoring programs provided by private firms, which makes the distinction between privately and publicly offered tutoring more difficult.
[4] Throughout this study I refer to private supplementary instruction and private tutoring interchangeably.

Lexis-Nexis, a database that covers all the articles published in nationally well-known newspapers such as *The New York Times* or *The Washington Post*, shows that articles covering the topic of "private tutoring" in the context of American schools rarely appeared early in the 1990s (for example, just 18 counts in 1994). During the last decade, however, the coverage of this topic rapidly increased (for instance, 98 counts in 2004).[5] Examples of recent articles include:

> The boom in individualized instruction is felt not only in schools and homes but also in suburban malls as well, where commercial chains such as Sylvan Learning Centers hang their shingle next to stores like the Gap (Helfand, *Los Angels Times*, 1999, p.B.2.).

> Years ago, with a very few exceptions, tutoring was for students who were floundering or failing. Today it is a booming industry, fueled by parental angst over the college admissions process, that helps not only children who are struggling, but also gilds the lily, moving "B+" students to "A" students, giving extra support to students enrolled in honors and Advanced Placement courses and propelling children with high test scores into the very top percentiles (Lombardi, *The New York Times*, 2004, p.1.).

At the same time, household or parenting magazines, from nationally based ones such as *Child* and *Working Mother* to locally distributed free papers, also feature the subject of private tutoring. Examples include:

[5] The count may vary depending on which search keywords are used.

> "A few years ago, the families sending kids to tutors were those that had extra income. Now families of all income levels and children of all skill levels – ahead, behind, and average – see tutors." (Fashola, as quoted in Rusch, *Child*, 1999, p.62).

These magazines approach the topic mainly from the consumers' perspective, considering such issues as when to use, what to choose, and what to expect from private tutoring. In fact, it is in these types of print media that families are often exposed to the term "private tutoring." The article in *Child* also estimated that at least several million children were using tutoring programs run by such private firms as Sylvan Learning Center, Kumon Math and Reading Center, and Huntington Learning Center (Rusch, 1999). People are increasingly looking at the phenomenon of the PSI with more interest.

Interest of the Government – The No Child Left Behind (NCLB) Act

In January 2002, the No Child Left Behind (NCLB) Act was signed into law. The U.S. Department of Education states that "the Act is the most sweeping reform of the Elementary and Secondary Education Act (ESEA) since ESEA was enacted in 1965 (2002)." The Act aims to redefine the federal role in K-12 education and help close the achievement gap that exists among disadvantaged and minority students and their peers (U.S. Department of Education, 2002a).

With a view to closing the achievement gap for disadvantaged students, the Act allows federal funds under Title I [6] to be spent more effectively and with greater accountability. To this end, states and school districts are to develop stronger systems of accountability based on student performance, with increased levels of local control and flexibility. Under the Act, each state must establish a definition of "adequate yearly progress (AYP)," which will be used to evaluate the performance of each school district and school. School districts must identify Title I schools that fail to meet the requirement set by the state for two consecutive years. Such schools must develop and implement improvement plans to strengthen instructions and address issues that caused the schools to fail. These schools must also provide public school choice and, as they call it, *supplemental educational services.* In other words, parents of disadvantaged children who go to failing public schools will have more options – they may transfer their children to other schools or receive Title I funds to acquire supplemental educational services from a provider of choice that is approved by the state.

It is no less important to point out that the notion of human capital theory certainly underpins the development of the NCLB Act, as clearly shown in the beginning of the statement made by the President George Bush concerning the Act: "In a constantly changing world that is demanding increasingly complex skills from its work force, children are literally left behind (Bush, 2001, Foreword)." According to the U.S. Department of Education, *supplemental educational services* are defined as "additional educational opportunities for academic instruction designed to increase the academic performance of students" (U.S. Department of Education, 2003, Title I, section 1116(e)).

[6] Title 1 is the largest federally-funded educational program with an aim to provide resources to improve academic achievement of students from disadvantaged backgrounds.

Such services can include tutoring, remedial courses, and other educational interventions. These services also must be provided outside of the regular school day. It is in this context that private tutoring, or supplementary instruction, is starting to receive greater attention not only politically but also commercially as described in the next section.

Interest of Providers

Private providers of education services have lately expanded their range and volume of activities, and PSI is no exception. After all, education as an industry represents a large market. According to an industry report, the revenue of the education industry as a whole reached $102 billion in 2001, of which $58 billion went to K-12 education. Testing preparation and tutoring services accounted for 7.4%, or $4.3 billion (Gallagher, McVety, Newman, and Trask, 2002) and was predicted to be $4.6 billion in 2004 and $5.2 billion in 2005 (Lombardi, 2004).

The involvement of private firms in educational services was noticed even before 2002, but once the Bush administration announced the possibility of providing federal money to be used for PSI, the interest in this area took off. Industry reports predict that K-12 testing and professional development will be one of the fastest growing markets, as they are spurred by the new spending emphasis on testing and supplemental educational services at the federal level with NCLB (Walsh, 2002). The Education Industry Association (EIA), a network of professionals who are concerned with education business, was founded by just 16 people in 1990, but 13 years later it has more than 800 members. In one of its newsletters, the head of a tutoring firm that provides students with tutoring services online states: "By all accounts, the supplemental services provision of the

NCLB Act could have a tremendous economic benefit for small tutoring companies" (Cigale, 2003). A leading company that has been offering PSI, Catapult Learning (formerly called Sylvan Education Solutions), was approved in 29 states to offer PSI under the scheme of NCLB at the beginning of the 2003-2004 school year, and projected to serve between 15,000 and 20,000 students with its PSI programs (Gorman, 2004).[7]

It is worth noting that characteristics of tutoring providers vary tremendously. Some are very large and internationally operated, while most of them are locally based and even run by households. Some of the large-scale firms that provide tutoring services are shown in the Tables 1.1 and 1.2. The first Table 1.1 includes companies (programs) that offer advancement PSI and their types of services, prices, duration of programs, unit cost per hour, the number of students and the number of centers at the national level reported by the companies. The second Table 1.2 contains those that offer remedial PSI with the same types of information.[8]

From these tables, at least two things can be observed. First is variability. Even among these large-scale providers, there are large variations in terms of services, durations and fees. For example, a student can take a Standard Aptitude Test (SAT) or American College Test (ACT) preparation course in a classroom, receive private lessons taught by a personal tutor, or through a course taught online. Classroom instruction is

[7] PSI firms are increasingly visible in public schools by offering tutoring or the SAT/ACT test preparation programs on–site in collaboration with schools. Such collaboration existed even before supplemental education service of NCLB was implemented. With the introduction of NCLB, however, the presence of private firms in public education becomes even stronger – which can be viewed as additional evidence of an overall trend toward the privatization of U.S. public education. Not surprisingly, some view this phenomenon as a threat to democratic education with social, cultural and political implications (See, for example. Gerald Bracey's remarks in Hardy, 2003).

[8] Advancement PSI is a type of tutoring which aims to give students an academic advantage, and the most well-known form is to assist high school students to prepare for college entrance examinations such as the Standard Aptitude Test (SAT) or American College Test (ACT). Remedial PSI aims to help students who are struggling academically at school to overcome learning obstacles and improve grades. The more detailed explanation is provided in the following sections .

Table 1.1 Private Tutoring Firms (Advancement)

Advancement PSI

	Purpose	Type	Fee	Duration	Unit cost (Per hour)	No. of centers	No. of students	Source
Kaplan	SAT prep	Classroom	$899 (2006)	40 hrs[3] (12 weeks)	$22	n/a	n/a	Website (2006)
		Personal tutor	$2,199-3,399 (2005)	20-32 hrs	$106-110	n/a	n/a	Website (2005)
		On-line	$399 (2006)	50 hrs	$8	--	n/a	Website (2006)
Score! [1]	Advancement (Pre K – 10th)	Classroom (computer-based)	n/a	n/a	n/a	165 (11 sates) (2006)[2]	82,000 (2006))[2]	Website (2006)
Princeton Review	SAT prep	Classroom	$999-$1,500 (2006)	30-40 hrs	$25-$50	n/a	120,000 (2006)	Website (2006)
		Personal tutor	$2,300-6,900 (all subject, 2006)	23 hrs	$100-300	n/a		Website (2006)
		On-line	$399-699 (Live or non-live advice, 2006)	20-30hrs (interactive)	$20-$23	--		Website (2006)
Sylvan Prep (Educate, Inc)	SAT prep (9-12th)	Classroom	n/a	n/a	n/a	1,121[2] (2006) (North America)	322,777 (2004)[2]	Website (2006)

n/a: data are not available, --: data are not applicable.
1 Score! is the Subsidiary of Kaplan, Inc.
2: The figure also includes students who take remedial PSI.
3. Hours vary by location.

Table 1.2 Private Tutoring Firms (Remedial)

Remedial PSI

	Purpose	Type	Fee	Duration	Unit cost (Per hour)	No. of centers	No. of students	Source
Sylvan Learning Center (Educate, Inc)[1]	Remedial (some advancement) (K-12th)	Classroom	$3,200-$4,200 (2006)	60-120 hrs	$35-53 / hr	1,121[2] (2006) (North America)	322,777 (2004)[2]	Gerhardt (2004) Website (2006)
		On-line	$150 (assessment)	Vary	$37-41 (2004)	n/a		Gerhardt (2004)
Kumon Math and Reading Center	Remedial (some advancement)	Classroom	One-time registration fee $30-$50 $80-$100 /month (2006)	Continuous	n/a	1,278 (2006)	159,495 (2006)	Website (2006)
Score!	Remedial Pre K – 10th	Personal tutor (small group)	n/a	n/a	n/a	165 (11 sates) (2006)[2]	82,000 (2006) [2]	Website (2005)
Hunting-ton Learning Centers, Inc.	Remedial	Classroom	n/a	n/a	n/a	250 [2] (37 states) (2006)	45,000 [2] (1999)	Rusch (1999) Website (2005)

n/a: data are not available, --: data are not applicable.
1: Educate Inc also has Catapult Learning Center which provides government-funded supplementary services at schools (Website, 2006)
2: The figure also includes students who take advancement PSI.

generally least expensive, ranging from $22 to $50 per hour for advancement PSI and from $35-$53 for remedial PSI, while a personal tutor for advancement PSI can cost a student from $100 to $300 per hour. Such variability certainly makes conducting research on PSI challenging.

Second, it shows that taking PSI can be very costly. Companies often offer the program as a package, and, therefore, if a student wants to take the package to prepare for the SAT, for example, it can cost nearly $7,000. Needless to say, not every family can afford such expensive services.

Limited Research

While it is certain that interest in PSI is growing among parents, policymakers, and providers, the amount of research that has examined the status or the effect of PSI on learning among American students has been very limited especially in empirical forms.[9] With the implementation of the NCLB Act, students of low-performing schools now have an option to use private tutoring financed by Title I money. However, some are questioning the use of federal money for private tutoring since, they argue, its effect on student performance is largely unknown (Sunderman and Kim, 2004).[10] We certainly need to be more enlightened about the potential impact of PSI on student outcomes,

[9] Researchers of basic education systems in other countries have attempted to analyze private supplementary instruction cross-nationally or in the context of their respective country, such as Japan and South Korea. (Akiba and LeTendre, 1999; Baker, Akiba, LeTendre, and Wiseman, 2001; Bray, M., 1999; Harnisch, 1994).

[10] Data collection about PSI has been quite insufficient until recently, especially at the national level. For example, as for supplementary services provided under the scheme of NCLB, we do not know how much federal money has been spent with regard to the tutoring provision, how many children were eligible, or how many children actually signed up for tutoring services (Gorman, 2004).

especially as this form of education becomes more widespread and competes with public institutions for public funding.

As we are observing a surge of interest in and use of PSI among various groups – families, policymakers, and providers - I would like to explore and analyze the possible consequences of the use of PSI – in terms of who is using PSI and what kind of impact it has had on its users. To address such questions, I use a nationally representative database and build analytical models based on the conceptual framework that I establish, which is explained in the next section.

Conceptual Framework and Analytical Models on PSI in the Context of U.S Education

The primary intent of this study is to explore issues related to PSI in the context of U.S. education. To this end, the study addresses two areas of interest: (a) providing a conceptual framework to broadly illustrate the current status of PSI in U.S. education; and based on that framework, (b) specifying analytical models to empirically analyze two central research questions: (i) who uses PSI and why, and (ii) what are the effects of PSI use on student outcomes. Since PSI is a form of investment in education, this study aims to analyze this emerging phenomenon through the lens of human capital theory.

While this study employs the concept of human capital theory as a theoretical framework to see if it helps to analyze the PSI questions, it does not attempt to examine the validity of human capital theory itself nor interpret the findings within a strict analytic model used in human capital research. A human capital framework generally requires estimating the benefits made by an input (in this case the use of PSI) in monetary terms (which are usually expressed in terms of wage differences) so as to compare benefits of

the output against costs for the input (both opportunity costs and financial costs). . Unfortunately, no national dataset exists that permits a full assessment of either the costs of PSI or the possible monetary returns of PSI to students. Nonetheless, it is possible to use existing datasets to propose a conceptual model for examining PSI use and its possible benefits in terms of intermediary outcomes linked to future earnings – namely, achievement and attainment (college enrollment). Therefore, as stated before, the primary goals for this study are to propose a conceptual framework to analyze PSI, and to provide a profile of PSI users and examine the potential benefits of PSI consistent with the general claims of human capital theory. Because academic research, particularly empirical research, is so limited on this subject, especially in the context of U.S. education, I consider that an attempt to establish a conceptual framework and conduct exploratory research is an important step forward to understanding this relatively unexplored topic. As mentioned earlier, while interest in PSI is rising in various segments of our society, and PSI is already endorsed by public policy, we know very little about PSI and its possible consequences for individuals, schools, or society (Jacobson, 2004).

To accomplish these goals, I have chosen to focus on PSI use by high school students. High schools students are one of the age groups where the use of PSI is most frequently observed (Bray, M., 1999), and the relevant data to examine PSI use are available. I conduct a set of statistical analyses using a dataset that has been collected at the national level, the National Education Longitudinal Study (NELS) of 1988. Using such a national level dataset would be a good approach for an exploratory study since it permits an investigation of general trends to obtain an overall picture of the phenomenon.

NELS is a general-purpose survey that provides a wide range of data about a large, nationally representative sample of 8th grade students in 1988. The survey design called for following this cohort of students in the 10^{th} and 12^{th} grades, as well as following a subset of the population after graduation when students enrolled in post-secondary institutions or entered the workforce. The dataset that I have used for this study involves surveys conducted in 1988 through 1994. While the data is roughly 13-15 years old, these surveys still contain some of the most detailed information about PSI use currently available and, as mentioned earlier, using such dataset provides a good baseline for future research when newer and more detailed datasets become available. The details of the NELS dataset are explained in chapter III. Next, I define PSI within the context of U.S. education and I delineate more precisely those aspects of PSI that I examine in my study.

Defining PSI in U.S. Education

As a first step to building a conceptual framework, Table 1.3 is presented to illustrate the types of PSI programs that we find most often in the United States. It aims to highlight the complexity and variety of PSI currently available. Various tutoring programs are classified by instructional goals (advancement and remedial), the sources of finance (private or public) for users, and methods of instruction (individual, group or correspondence).

Table 1.3 Taxonomy of PSI in the United. States [1]

Type of PSI		Source of finance for users [2]	Instruction method	Covered by this study
Advancement	College entrance exam (SAT, ACT) preparation	Privately financed	Private (one-on-one) tutoring	X
			Group lessons	X
			Correspondence (mail or internet)	X
	AP and other types of advancement		Private (one-on-one) tutoring	
			Group lessons	
			Correspondence (mail or internet)	
	College preparation: financial assistance designed to help needy students	Non-privately financed	Private (one-on-one) tutoring	
			Group lessons	
			Correspondence (mail or internet)	
	School-based test preparation courses (offered by private firms)		Group lessons	
Remedial	Remedial	Privately financed	Private tutoring	X
			Group lessons	X
			Correspondence work by mail or internet	X
		Non-privately financed	NCLB (since 2002-) Private tutoring	

1. Table 1.3 includes PSI programs that are most commonly available in the United States. It does not necessarily cover all the types of PSI that exist in this country. There are also enrichment programs, such as those in music and art that are offered privately out-of–the school time. Since they are not strictly academic instructions, they are not included in this table. Additionally, while these are not offered privately, tutoring instructions are also offered by staff in the school, school districts and teacher unions.
2. "privately financed" means that the cost is born by families; whereas "non-privately financed" means that families get financial support to pay for PSI.

In Table 1.3, the columns are organized from left to right as types of PSI, sources of finance (who pays for the PSI), and instruction method. The column on the far right is to show which types of PSI are addressed by the current study. There are two types of PSI programs: advancement and remedial. PSI is almost always provided by private entities (individuals and firms), but it is sometimes purchased non-privately (e.g. governments or community groups provide funding) as explained below.

Advancement PSI programs paid for by families (privately) include those that prepare students for college entrance examinations, such as the SAT and ACT, and others that aim to give students academic advantage (e.g. a program to prepare for Advanced Placement (AP) examinations). There are other occasions when advancement PSI is paid for by somebody other than families of students. For example, some students may get financial support for PSI, or their schools offer PSI in collaboration with private tutoring companies.[11] Remedial programs can also be financed by families or other third parties. The most notable example of the latter is the NCLB provision where children who go to academically failing schools receive federal funds to take private tutoring. For each type of program, there are also a number of ways to receive instruction, such as one-on-one tutoring, group lessons, and correspondence through the Internet.

It must be noted that this study does not focuses on all these PSI programs, but only a limited set of PSI programs: individual tutoring, group lessons, and to a lesser extent, correspondence courses for advancement or remediation (programs noted with X marks in Table 1.3). My study aims to focus on the use and effects of PSI that are both provided and financed privately so that the objective of PSI use is clearly more in line with personal investment.[12] A more detailed explanation of each type of program is provided in the next section.

[11] Although in my study I generally refer to PSI as the instructional services that are both offered and purchased privately (hence "private"), Table 1.3 aims to depict the PSI in a broader sense and, therefore, it also includes services that are offered by private firms even when they are not purchased privately (see also later section on "Who pays for PSI"). Additionally, schools also often offer students with learning issues tutoring by their own teachers and peer students. Such programs do not belong here since they are not privately offered *for a fee*.

[12] Due to the ways questions are asked for families, there is a possibility that my analytical sample may include a very small number of families who used PSI while getting some form of financial assistance.

Two Types of PSI Addressed in This Study

As I just noted, PSI programs are offered in a variety of forms by various types of firms or individuals. However, in terms of program content and academic goals, two different types of PSI programs are of interest to this study – advancement (test preparation) or remedial. Since each type has very distinctive academic objectives and potentially target different clientele, such differences may affect families' decisions as to which type of PSI program to choose (or not to choose).[13] Therefore, these two types of programs should be treated separately in the analyses of PSI use and benefits (Baker, Akiba, LeTendre, and Wiseman, 2001, Coulson, 1999). The following is an explanation of each type of program.

Advancement (Test Preparation) Programs[14]

This type of program aims to give students an academic advantage. For high school students, its ultimate goal is to enhance the chances of getting into better colleges. Students most often receive test preparation courses for college entrance examinations, such as the SAT or ACT. There are also advancement programs that help students

[13] The differences in academic goals are obvious in advertising words by commercial PSI providers. For example, Huntington, one of the leading providers in remedial PSI, says in the brochure that "Why do smart kids struggle?" "Poor grades hurt the entire family," while Princeton Review, one of the leading companies that provides advancement PSI (SAT preparation), says in their website that "Guaranteed score improvement from the test prep expert" or Kaplan, another leader in this industry, writes that "Kaplan helps individuals achieve their educational and career goals."

[14] I also call it *test preparation* program here since in the U.S market, most of the PSI programs that are advancement in nature are to prepare students for college entrance examinations, such as PSAT, SAT and ACT, although, as stated in the text, there are other types of programs that aim to give students an academic advantage. In other countries, such as Japan, however, PSI providers more often specifically state if their programs are for students who need remedial work or for those who hope to get a competitive edge academically, and the latter program is not only for test preparation but also for further improving GPA.

prepare for AP examinations or some forms of exclusive private tutoring. I predict that students who use this type of PSI tend to be, but are not limited to, high-achieving students. This type of PSI has a goal clearly in line with human capital theory.

Remedial Programs

This type of program aims to help students who are struggling academically at school to overcome learning obstacles and improve grades. Remedial programs are often offered at a smaller scale, for instance through individualized tutoring or small group tutoring. Due to the nature of these programs, students who take this type of PSI are presumably low achievers. Although the goals of remedial programs may not seem, at first glance, to be as directly linked with the benefits identified by human capital theory (e.g. increased income), the purpose of remedial PSI could still be to enhance current performance so as to increase access to educational opportunities linked to occupational opportunities and future earnings.

Who Pays for PSI

While PSI is almost always offered by private entities, there are circumstances where parents may not always pay for PSI. There are examples of scholarship programs that help student athletes or minority students finance the SAT/ACT tutoring programs for college admission. While comprehensive data are not available to estimate the scope of financial assistance to use PSI for low-income or disadvantaged populations of students, such financing does occur. After the introduction of the NCLB Act, which has a provision to provide parents with federal funds to use remedial PSI, it becomes even

less clear who is financing PSI. Nonetheless, this study focuses on supplementary instruction – either for the purposes of advancement or remediation – that parents report paying for themselves.

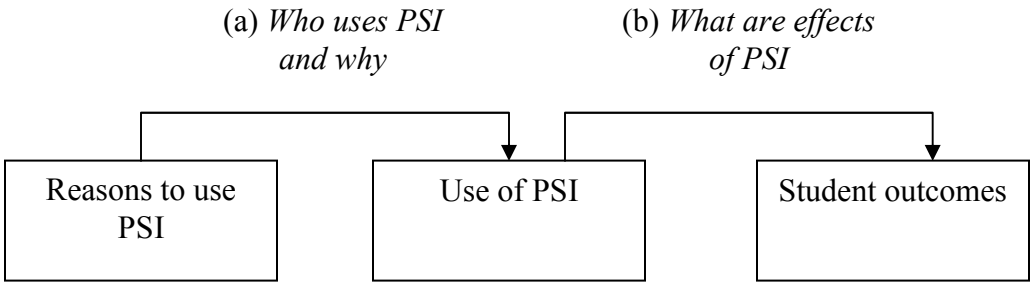
Conceptual Model to Analyze the Use and Effects of PSI

In this section I present the conceptual model that I use to analyze the use and effects of PSI. I start by showing the basic structure of the model, and expand it to include all the important elements that I consider necessary to address my research questions.

Basic Structure of the Conceptual Model

Figure 1.1 highlights basic elements that I think are important in analyzing the PSI phenomenon. They are key relationships in my conceptual model from the human capital perspective. This basic structure shows that my conceptual model is based on two central questions: (a) who uses PSI among high school students and why; and (b) what are the effects of such use of PSI on student outcomes.

Figure 1.1 Basic Structure of the Model



To investigate *who* uses PSI and why, I focus on demographic characteristics of families and their reasons or motivations for using (or not using) PSI. Using PSI generally requires families to bear the cost (and time) of supplementary services. Does such willingness to use PSI by paying extra money and spending extra time come from a belief in the value of human capital? The first part of the model examines this relationship. On the other hand, even when families are willing to pay for and use PSI, there may be other factors that prevent them from taking advantage of such educational opportunities (e.g. possible availability of funds or service providers). Such contextual reasons are also addressed in the first part of my analyses.

In examining the effects of the use of PSI on student outcomes, I attempt to determine if these effects are consistent with human capital theory – that is, whether the use of PSI results in some benefit to the user that might lead to eventual increases in earnings. Since my analytical sample consists of high school students, I examine the effects of PSI use on both achievement and attainment, which are: (a) improving mathematics achievement scores and (b) increasing the chance for college acceptance. I chose mathematics since past studies show that this subject can be influenced by the use of PSI (Kenny and Faunce, 2004), and achievement gains in this area might create greater

opportunities for future investments in human capital (e.g. particular college majors) (Lee, Smith, and Croninger, 1997). Therefore, I treat this subject as the focus of PSI study. I chose college acceptance because post-secondary education is increasingly related to occupational status and earnings (Becker, G. S., 1962; Card and Krueger, 1996).

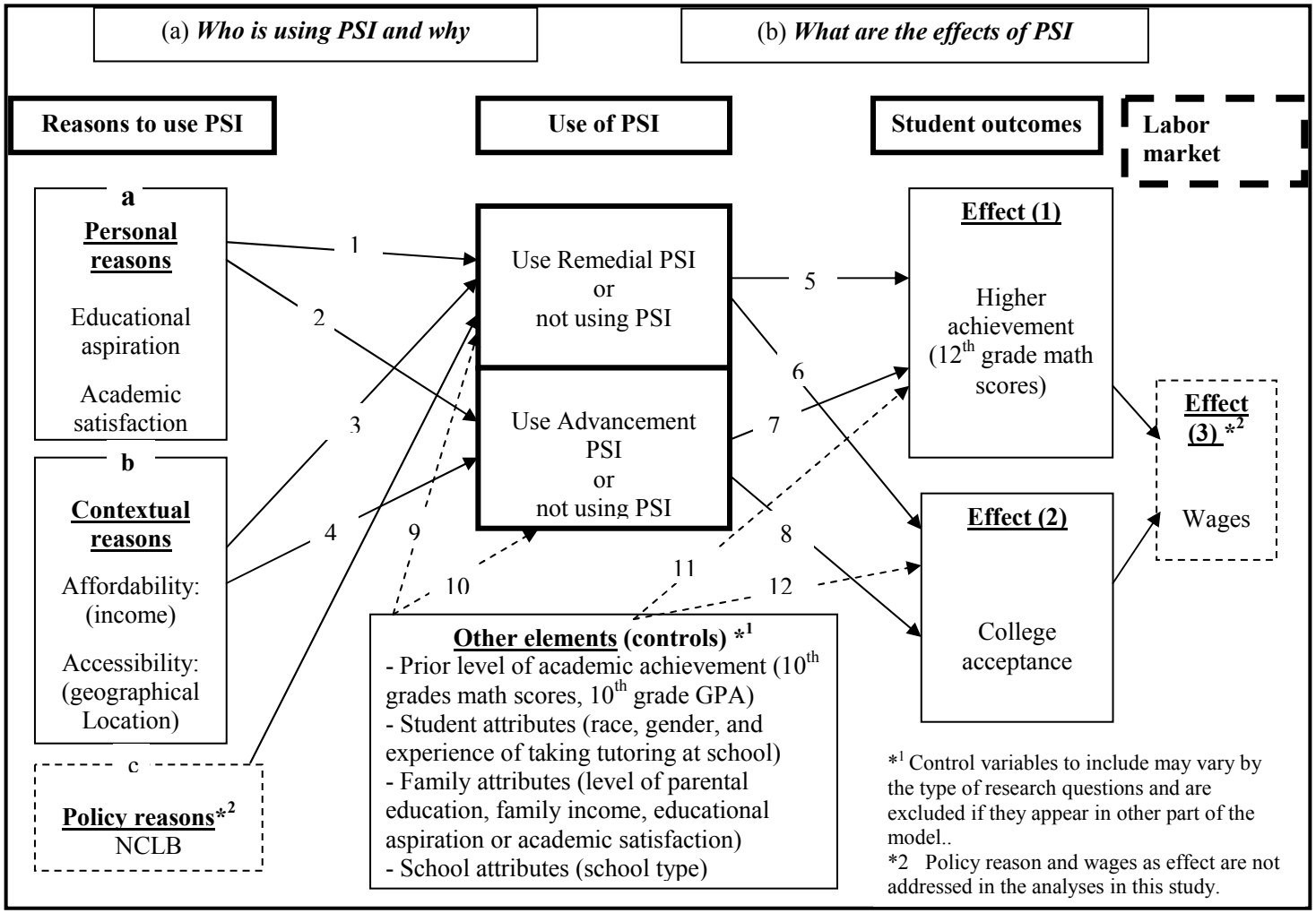
In the next section I provide the general conceptual model that includes all elements that I think are important in analyzing the research questions on PSI. Then I elaborate more on the first main question of my analyses: who uses PSI and why. This is followed by discussing the second main question: what are the effects of PSI use.

General Conceptual Model on PSI

Figure 1.2 presents the general conceptual model that includes all the constructs that I believe are important for the analyses of PSI. Since this is a general conceptual model based on the human capital theory, note that it includes some elements that are not examined by this study. Two central questions in the basic structure remain unchanged and underpin the concept in developing this general model. The boxes on the far left are constructs related to the reasons to use PSI. The center boxes represent the actions of using (or not using) PSI. Those on the far right are constructs about the effects of the use of PSI. The straight-line arrows indicate the possible causal relationships between constructs that I would like to investigate. The dotted-line arrows indicate the possible influence from other variables (e.g. income) that I would like to take into account.[15]

[15] It is possible that this conceptual model may not include all the possible factors that can influence relationships of interest, but the initial exploratory model requires the simplification of assumptions.

Figure1.2 Conceptual Model for Analyzing the Use and Effects of PSI



For the purpose of presenting the general conceptual model regarding PSI issues in the United States, I include two elements that are not addressed in my study due to unavailability of data but are conceptually important when the use and effects of PSI are considered. One is policy-related reasons to use remedial PSI. Such viewpoint becomes relevant after NCLB is enacted and families may (or may not) get incentives to buy PSI with federal money as the Act plans. However, the data I use do not allow me to consider this element. Another is the possible effect on future wages. As already mentioned, one of the important goals of investing in educational opportunities from a human capital perspective is to improve one's wage level or earnings. Again, the data I use do not permit a full examination of these effects. However, I include both of these elements in order to present a more complete conceptual model, so as to guide future research should the data for a more comprehensive analysis become available.

In the following sections, I provide more details about the constructs and the relationships concerning two central questions, the use of PSI and the effects of using PSI on student outcomes.

Analysis of Who is Using PSI

When analyzing the use of PSI, there is an important distinction that needs to be made: there are personal reasons to use (or not to use) PSI, and contextual reasons to use (or not to use) PSI. The first can also be viewed as internally-oriented motivations, and when such motivation is strong, families may be more willing to use PSI. On the other hand, the contextual reasons are by nature externally-given (non) motivations, and even

when families are willing to use PSI, there are some circumstances that they do not have control over, which may prevent them from using PSI.

While the personal reasons are more directly related to the concept of human capital theory, I would also like to address the contextual reasons due to their possible implications on equity.[16] The review of past research shows that such contextual reasons can prevent families from using PSI and receive possible benefits even when they have strong personal incentives to use PSI, thus leading to potential inequities in educational opportunities and experiences. In the following section, I explain what I mean by personal reasons first.

Personal Reasons (Motivations) Regarding the Use of PSI

There are reasons that make students and/or parents more likely to turn to PSI. Because PSI is neither free nor compulsory, families who are willingly to spend their money on such educational programs are more likely to share belief consistent with human capital theory – in other words, they are more likely to believe that such an investment in educational programs will improve the academic standing of their children in the short-term, and the level of academic attainment and income in the long-term.

Aspirations and satisfaction. As shown in Figure 1.2, there are two types of personal reasons that I would like to focus on: educational aspirations and academic

[16] With the introduction of the provision in NCLB that enables students to use PSI with public funds, another equity-related issue has arisen: differences in program quality. While the main issue is still access (a large proportion of eligible students have not used this opportunity), it has been reported that monitoring scheme by the states of the quality of supplementary services under NCLB has been weakly implemented (Gewertz, 2005; Hess and Finn, Jr, 2004). Given the variability in types of PSI we find in the market, it would not be surprising if the quality of PSI programs financed by NCLB scheme also varies, especially in the absence of effective monitoring.

satisfaction with schools by families. First, I would like to see how parents' and/or students' educational aspirations affect the use of PSI, since I think that the more academically aspiring families are (measured, for example, by the desire for higher levels of academic attainment), the more likely they are to seek opportunities to improve educational opportunities for their children. And such an opportunity may well be provided through PSI (see, for example, Powers and Rock, 1999).

Research has shown that when families are more involved in the academic activities of their children, the level of academic achievement of their children is positively influenced. One of the most important predictors of involvement consistently identified by studies is parental aspiration for children's academic achievement and attainment (Epstein, 1992; Fan and Chen, 1999; Keith and Keith, 1993; Singh, Bickley, Trivette., Keith, Keith, and Anderson, 1995; Stevenson and Baker, 1992). It seems reasonable, therefore, that families with higher levels of academic aspirations would be more likely to use PSI, especially if they believe that doing so would provide a competitive edge for children.

According to Baker and colleagues (2001), the use of PSI is a reaction to intensified competition for further educational and market opportunities. In other words, the use of PSI is a way for people with high levels of educational aspiration to buy an educational advantage for their children. It may also be a strategy for preventing children from "losing" a competitive edge, as when parents invest in tutoring to keep children from falling behinds their peers in school. Using NELS, I would like to see if there is any evidence that PSI use in the United States in the 1990s is consistent with such a process.

Second, I would like to see if the level of satisfaction with education that children are receiving currently in school could affect the decision to use PSI. The likelihood of using PSI may also increase when families think that the education offered at their current school is not meeting the needs of their children, such as addressing learning difficulties in certain subject matters (Walsh, 1999a). Baker and colleagues (2001) views this type of use of PSI as a kind of market reaction to "underdevelopment" where people have less confidence in available school quality and turn to the opportunities for learning outside of schools. There is even a view that the use of PSI reflects the preference for an affordable alternative to public education – a potentially more affordable substitute for expensive private schools (Davies, 2002).

Compared to the first question which primarily focuses on long-term aspirations such as the expectation for post-secondary education, the second question addresses relatively short-term aspirations, since it is the current state of education that is in question. I'd like to see if the following relationship holds – the more unsatisfied families are with the current state of education, the more likely they are to use PSI.

Contextual Reasons Regarding the Use of PSI

Even when parents want to use PSI, there are financial and geographical *access* issues in terms of: (a) availability of income to spend for PSI; and (b) accessibility to the location where PSI is provided. If the effects of PSI are found to be positively related to student outcomes, access to PSI raises important equity issues, since some students may have greater access to these services than the others. As shown in Tables 1.1 and 1.2, PSI is often quite expensive and there is evidence that students from higher socio-economic

backgrounds are more likely to take advantage of such opportunities (Baker, Akiba, LeTendre, and Wiseman, 2001; Greaney and Kellaghan, 1995; Schwartz, 1999, Stevenson and Baker, 1992). Also, centers that offer tutoring services are often located in shopping centers in wealthy neighborhoods (Walsh, 2002). Under the NCLB Act, schools in rural areas are finding it hard to identify providers for parents to choose from when their children become eligible to receive supplementary education services (Gewertz, 2004; Gorman, 2004; Medler, 2004;Richard, 2005). Affordability and accessibility, therefore, may play important roles in the decision to use PSI.

Scholars who look at human capital development have been concerned with its equity implications since, as Schultz (1971) states, studies have found that changes in the investment in human capital are the major factors that can affect equality in the distribution of personal income. Therefore, I would like to see if families who have less disposable income or those who live in rural areas where they are less likely to have access to PSI, are less likely to use PSI. In doing so, again, I would like to pay attention to the different types of PSI and consider the possible effects of different control variables.

Control Variables

It needs to be noted that there are factors other than personal or contextual reasons that might influence who uses PSI or what the effects are of the use of PSI (Usui, , Lei. and Butler,, 1981). In building the general model, the effects of such factors should also be considered carefully, so that analyses of the relationships between primary variables of interest will not be masked or distorted by factors not included in analytical models.

Although the adequate specification of a model is always a matter of debate, I include in my analysis factors with policy relevance or factors that might be thought of as posing alternative explanations for the use and effects of PSI. Those factors are so-called control variables in statistical analyses.

Previous academic performance. One possible factor that can influence the use of PSI is the level of past academic performance by students. It is possible, for example, that low-achieving students are more likely to use remedial PSI, whereas high-achieving students are more likely to use advancement PSI. This study measures students' past academic performance by 10th grade mathematics achievement tests given as part of the NELS study and by students self-reported 10th grade mathematics GPA included in the NELS student survey.

Other factors as control variables. There are other factors that can affect the relationship in question, as well as provide policy-relevant information about the use and effects of PSI: (a) students' attributes (race, gender, experience of taking remedial or test preparation tutoring at school); (b) family attributes (level of parental education, family income, geographical location of families, educational aspiration and academic satisfaction) [17]; and (c) school attributes (types of school). I would like to see the results of my analyses keeping these factors constant.

[17] Measures on family income, geographical location, educational aspiration, and academic satisfaction are used as input variable in research questions on the use of PSI, and in that case they are excluded from a group of control variables used for the analytical models. On the other hand, research questions on the effects of PSI have measures on aspiration, satisfaction, income and geographical location as controls.

Inclusion of student attributes as controls are to see if the basic relationships associated with the use and effects of PSI are independent of such student profiles as gender and race. The addition of variable that asks students about their experience with school-based tutoring programs (both remedial and test preparation types) as a control is to remove possible effects, if any, of those programs on the decision to use PSI. It is possible that when a school offers its own tutoring programs, families are less motivated to use outside of school and for a fee programs. Family attributes are considered based on the possibility that if parents are more educated, or if they have more income, the chances of their children using PSI may rise (Schwartz, 1999). Finally, school attributes such as school type is included since public school and private school students and families may have different attitudes about using PSI or experience different results.

Models on the Use of PSI

Models that explore the use of PSI take into account measures on personal (1st set of primary independent variables) and contextual reasons (2nd set of primary independent variables), as well as all control variables. Returning to Figure 1.2, the arrows 1, 2, describe the analytical models to examine how personal reasons can affect the use of certain PSI programs. Here I would like to see not only whether the difference in the level of aspiration or satisfaction affects the decision to use PSI, but also if differences may affect which type of PSI, either advancement or remedial, that families decide to use. Satisfaction and aspiration are included in the same model so that the effects are independent of each other. Given the nature of each type of PSI program, it might be possible that families who have higher aspirations are more likely to use advancement

type PSI, whereas families whose children are struggling academically are more likely to use remedial type PSI.

There are also contextual (external) reasons that may keep families from using PSI. Since these external reasons are closely related to an important issue, equity (that is, opportunities for learning), relationships among such external reasons and the use of PSI also need to be carefully examined. In Figure 1.2, the arrows 3 and 4 depict the analytical models to examine how such contextual reasons can affect the use of certain PSI programs. Additionally, control variables (expressed by arrows 9 and 10) are also included in the model to eliminate possible competing reasons for families to use PSI.

These are important questions to ask because findings would help identify potential equity issues associated with families who cannot use PSI due to reasons outside of their control. The equity issues become even more critical when they are linked with the analyses on the effect side – that is, when students cannot use PSI due to contextual reasons and, consequently, are denied an educational advantage or valuable resource. Hence, examining the effects on outcomes is important from the equity perspective as well. Therefore, after analyzing the personal and contextual reasons for using PSI, I focus on the second part of my analytical model – the effects of using PSI on student outcomes.

Research Questions on Use of PSI

Taking into account the personal reasons and contextual reasons, the research question on the use of PSI can be summarized as:

(1) *Advancement PSI and aspirations or satisfaction*. When families and students have higher levels of educational aspirations, or when they have lower levels of academic satisfaction with their schools, are they more likely to use advancement PSI than the families who have lower levels of educational aspirations or higher levels of academic satisfaction? Do contextual factors, such as income (affordability) and geographic location (accessibility), have any effects on the decision to use advancement PSI?

(2) *Remedial PSI and aspirations or satisfaction*. When families and students have higher levels of educational aspirations, or when they have lower levels of academic satisfaction with their schools, are they more likely to use remedial PSI than the families who have lower levels of educational aspirations or higher levels of academic satisfaction? Do contextual factors, such as income (affordability) and geographic location (accessibility), have any effects on the decision to use remedial PSI?

Analysis of Effects of PSI and Research Questions

Whatever the reasons for using PSI, it is the benefit for users that is the most interesting from the perspective of human capital theory. In other words, if the use of PSI is related to positive outcomes, such as higher academic achievement and higher rates of college acceptance, and quite possibly higher levels of future income, it means that the theory of human capital is at work: the investment in education in the form of PSI is providing individuals with benefits that conceivably lead to higher future returns.

To analyze the effects of the use of PSI, I would like to examine possible effects on two important outcomes: (a) increase in the level of learning in mathematics measured by the standardized test scores among high school students; and (b) the possibility of four-year college acceptance. I chose mathematics to examine possible gains in achievement since several past studies identified mathematics as a focus of PSI (Kenny and Faunce, 2004) and mathematics is generally thought to be an important subject related to more advanced course taking in high school, which can lead to college admissions (Lee, Smith, and Croninger, 1997). By controlling for prior achievement, I am able to estimate the value-added effect of PSI use.

The right half in Figure 1.2 depicts the relationships that I would like to examine concerning the effects of PSI on student outcomes. Here I would like to investigate not only if the use of PSI affects student outcomes, such as achievement or college acceptance, but also if using different types of PSI (remedial or advancement) can have different types of effects on each outcome. The arrows 5, 7, and 11 depict the analytical models that examine how the use of remedial or advancement PSI may affect student achievement in mathematics, taking into account control variables. The arrows 6, 8, and 12 describe the analytical models that examine how the use of remedial or advancement PSI may affect four-year college acceptance. Therefore, research questions concerning the use of PSI and student outcomes can be summarized as follows:

(3) *Use of advancement or remedial PSI on mathematics achievement*. When students use advancement PSI or remedial PSI, are they more likely to improve their mathematics achievement scores in the 12^{th} grade, controlling for their mathematics achievement in the 10^{th} grade?

(4) *Use of advancement or remedial PSI on college acceptance*. When students use advancement PSI or remedial PSI, are they more likely to be accepted and enrolled in four-year colleges two years after graduating from high school?

The analyses of the effects of PSI use on student outcomes are of the highest importance, since a positive impact on their children's learning is arguably the primary reason why parents might be expected to invest in PSI.

Summary

In this chapter I reviewed the concepts of human capital theory, explained what PSI is and how PSI can be viewed from the human capital perspective. I also illustrated how interest in such learning activities is growing and how PSI use is expanding in the United States. I address two types of PSI – advancement and remedial – in this study. I then provide a conceptual framework to broadly illustrate the current status of PSI in U.S. education, and based on that conceptual framework, I specify analytical models and research questions to empirically analyze issues related to this subject in terms of (a) who uses (advancement and remedial) PSI and (b) what are the academic effects (achievement and attainment) of using PSI for U.S. high school students.

In the next chapter, Chapter II, I review the literature related to this topic and further reveal what we know about PSI so far, and how it is perceived and discussed both by the popular media and the research community. Since the use of PSI is even more common overseas, the literature on international education is also reviewed. I also

review literature on human capital theory that helped me to build the conceptual model for this study.

CHAPTER II: LITERATURE REVIEW

Introduction

This chapter presents a literature review concerning my research topic, which focuses on the use and effects of PSI. We hear often about terms like "private tutoring" or "after-school programs," but rarely see articles that treat the subject in a comprehensive and analytical manner. Indeed, there are very few studies that look at the state of PSI comprehensively or analytically. Therefore, to describe this relatively new phenomenon so that we will understand the magnitude and status of the subject, I would like to cover a wide range of sources, not only from the scholarly literature but also from articles in popular media.

I first describe how the issue of PSI has been covered and examined in the U.S. education system, focusing specifically on two distinctive types of PSI: advancement and remedial PSI. I start by exploring advancement PSI, so-called academic coaching in this country, in terms of its use, effects, and equity implications. Then I address another major form of PSI, remedial PSI, again with regard to its use, effects, and equity implications. In relation to the remedial PSI, I also look at a new federal policy that includes a provision on PSI, the NCLB Act, and in particular its implications in terms of remedial PSI. I also briefly summarize the historical background when the data that I use were collected in the early 1990s.

Then, for comparison, I introduce literature that addresses the state of PSI abroad, comparative studies as well as studies that focus on a single country, to show the prevalence of PSI use worldwide. Here again, I examine the use of PSI overseas in terms of it use, effects, and equity implications.

Finally, I discuss key literature on human capital theory, which I later use to develop a conceptual framework and set of analytical models that are the focus of the study. In doing so, my intention is to show why human capital theory might provide a useful theoretical framework in explaining the use and effects of PSI. The roles of aspiration, satisfaction and wage levels in the human capital context are also mentioned.

PSI as a Rising Phenomenon in the United States

PSI is rarely addressed in the United States as a research subject, especially compared to research that has been done in other countries. Therefore, in order to describe how the issues of PSI in the United States has been viewed and discussed in the literature, I will explore various sources of information, including popular media and scholarly pieces that look at private and non-private tutoring of U.S. students. In fact, the most intensive treatment of PSI as a subject in recent years comes from the popular media. Although the focus of those articles varies by the source, there seems to be one common finding: the use of PSI is expanding in the United States.

Two Types of PSI: Advancement and Remedial

There exist two distinct types of PSI in terms of program content, educational goals, and characteristics of users – advancement and remedial, as shown in Tables1.1. and 1.2 in Chapter I. In explaining PSI for this study, I would like to treat them separately, since different features can influence the analysis of the use of PSI and its effects on student outcomes differently.

Advancement PSI is a type of program that aims to give students an academic edge over other students. It can be offered to any age groups but its most well-known version is called "academic coaching," which aims to help students prepare for college admissions tests, such as the SAT and ACT [18]. On the other hand, the purpose of remedial PSI is to help students who are struggling academically at school to overcome learning obstacles and improve grades. Remedial programs are often offered on a smaller scale, for instance through individualized tutoring or small group tutoring. I first start with advancement PSI.

Advancement PSI (Academic Coaching)

Rise in the Use of Advancement PSI in the United States

Advancement PSI is used by students, who are often moderate to high-achievers, to further advance the level of their academic performance. In many countries, students use this type of PSI to improve the chances of getting accepted by academic institutions at higher levels, such as high schools and colleges. Even among these institutions, the intention can be to obtain access to more prestigious schools and colleges. In the United States, the best known advancement PSI programs provide instructions and materials designed to prepare students for college admission tests – specifically, the SAT and ACT. Such assistance for test preparation is called *academic coaching*, which includes "a wide variety of preparation activities undertaken by individuals in an attempt to improve test scores (Cole, 1982, p.32, quoted by Becker, B. J., 1990)." Test preparation activities can consist of practices in booklets, workbooks, or test preparation courses that are offered in classrooms, on-

[18] I also call this type of advancement PSI as test reparation PSI in this study.

line, or by individual tutors. Typical test preparation activities entail test familiarization, training in strategies in specific test formats or test taking skills, and subject matter review (Scholes and Lain, 1997).

Popular media are noting that the use of test preparation courses has become increasingly popular among high school students (Carr, 2004; Gordon, B., 2004; Lombardi, 2003; Marlantes, 1999, Schwartz, 1999). Some test preparation companies more than doubled the number of students served since the late 1980s (Bahrampour, 1999; Schwartz, 1999). They cite reasons for such increase as intensified pressure on students to perform well on standardized tests, and tougher competition to get into colleges (Murray, 1999). "A heavy-breathing test prep culture (Schrag, 2001, pp.B-8)," such as posters at school and letters home from schools, pushes parents and students to seek the opportunities to do better on these tests. The SAT preparation courses have also begun appearing in many high schools as a required course for juniors and seniors, and some school districts have even hired private tutoring firms to offer such courses (Marlantes, 1999). Furthermore, the format of the SAT was changed in 2005, both in terms of the test content and the scoring methods, which has created anxiety among students and parents, and contributed to further expansion of the use of private test preparation courses (Dobbs, 2005).

Aside from academic coaching for college entrance examinations, a relatively new phenomenon is to give students of all ages an academic edge by hiring tutors - from kindergartners to have a head start, to highs school students to thrive in honor or AP courses (Fuchs, 20024; Lombardi, 2004; Mullaney, 1998; Jordan, 1994). Hiring a tutor was once viewed as an indication of academic struggle if not failure, but such an image is rapidly changing. Receiving PSI can now be a sign of academic ambition

(Seymour, 2002). There is less of a stigma associated with hiring a tutor, especially among educationally ambitious groups of students (Jordan, 1994; Mullaney, 1998).

Mixed Findings on the Effects of Advancement PSI

Since the 1980s, the performance of students on the SAT has attracted more attention in academic circles and popular media. As the proliferation of commercial coaching schools is becoming obvious (Becker, B. J., 1990), the effects of various test preparation services on test performance have become a topic of interest. Consequently, some researchers conducted studies to look into the effects of coaching on the SAT performance (Becker, B. J., 1990; Scholes and Lain, 1997; Kulik, Bagert-Grwons, and Kulik, 1984). Research findings about the effects of test preparation on test scores have shown mixed results so far. Unfortunately, most of these studies do not distinguish coaching by the type of provider; that is, whether or not the provider of test coaching was public or private. Distinguishing private providers (commercial venders) from public ones (e.g. teachers) is important for my study because it fits well with a human capital perspective adopted by families to explain the use and effects of PSI. Whereas the use of a private provider more clearly suggests financial investments by parents (as parents normally pay for the services), the use of public providers does not. Nonetheless, it is still relevant to my study to review research that looks at how test preparation exercises conducted outside of the traditional school curriculum affect student performance.

One of the earlier and better-known studies in this regard is the meta-analysis conducted by Kulik and colleagues (1984), which reviewed 40 studies to find out the effectiveness of coaching in raising aptitude and achievement scores. Earlier reviews generally supported the effectiveness of test familiarity and practice on raising test

scores, (Kulik, Bagert-Grwons, and Kulik, 1984), but experts from testing agencies, such as the College Entrance Examination Board and Educational Testing Service challenged these reviews, insisting that their tests were largely resistant to the effects of drill and practice. Moreover, they argued that any score gains that resulted from such a practice would likely be insignificant and minimal. Kulik and colleagues, however, concluded that students can raise their scores on aptitude and achievement tests by taking a practice form of the test. The size of the effect was larger when an identical form of the test was used for practice, more practice tests were given, and when higher-achieving students received practice.

Later, B.J. Becker (1990) also conducted a synthesis of the literature by reviewing 23 published and unpublished reports. She re-coded certain characteristics, such as the nature of the study, sample, and the type of coaching-intervention based on the values she defined. She measured how mean changes for the SAT mathematics and verbal scores differ between coached and non-coached (control) groups, and analyzed those differences by regression analyses. Unfortunately, her study also does not distinguish coaching that was provided privately (PSI) from those provided by school providers. The study results were mixed. While several coached groups gained as much as three-fourths of a standard deviation (SD) more than those that were not coached, other coached groups gained one-fifth of a SD *less* than those that were not coached. On average, however, coached groups in her study gained three-tenth of a SD more than non-coached groups. Coached groups also had average scores that were 0.12 SD higher for mathematics than verbal tests.

A study which took into account the type of provider was conducted by Powers and Rock (1999), researchers who were associated with the Educational Testing Service (ETS), the organization in charge of test development and

administration. In response to the claims of such private tutoring firms as Princeton Review and Kaplan that students experienced a substantial improvement in their SAT scores after tutoring, Powers and Rock conducted a study on the effects of coaching on the SAT scores. They were particularly interested in whether revisions that were made to the SAT in 1994 might affect these claims. They sent surveys to randomly selected students who had taken the test in 1995-1996 to inquire about their involvement in the SAT preparation programs, including PSI. The survey revealed that 12% of the sampled students took coaching programs not offered by their schools. They also found that the coached students were more likely to be Asian Americans, had higher grades in high school, higher aspirations, spoke English more fluently, and had parents who had more formal education and higher incomes. Coached students were also more likely to prepare themselves with other methods, such as reviewing study aid books published by College Board or other companies. They concluded that simple comparisons of score gains would not be sufficient to examine the effect of coaching, so they built several analytical models, including analysis of covariance (ANCOVA) and repeated measures, to take into account the influence of background elements. The various analytical models yielded estimates that were not entirely consistent, but Powers and Rock think that two findings are clear: (a) there was an effect of coaching and that the effect was larger in mathematics than in reading; but that (b) the coaching effect was much smaller (increase in 21 to 34 points overall programs for mathematics and verbal combined) than what was claimed by commercial test preparation companies (about 120-140 points as a result of coaching).

Concerns for Equity

While the SAT scores do not guarantee automatic admission to prestigious schools, low scores can disqualify some candidates or deny their application for financial assistance. Some policy researchers strongly argue that reducing the test score gap between students would reduce racial disparities in educational attainment and earnings (Jencks and Phillips, 1998). If the claims made by some PSI providers are true – namely, that the use of test preparation courses can raise students' scores by hundreds of points – then access to PSI is certainly an equity issue. The costs of taking such preparation courses are prohibitively expensive for poor families, as these costs range from hundreds to thousands of dollars (Alexander and Richardson, 1999. See also Table 1.1 in Chapter I.). Since average test scores for students from disadvantaged backgrounds tend to be low, those who might benefit the most from such preparation courses may have the least chance to do so (Schwartz, 1999).

In his speech at the annual meeting for American Council on Education in 2001, Atkinson (2001) argued that the SAT was a poor indicator of students' success in college, and yet many parents were paying for the SAT preparation courses. He then continued, "Given attempts of some individuals and institutions to gain any advantage, fair or foul, is it any wonder that leaders of minority communities perceive the SAT to be unfair? (Atkinson, 2001)." Others are also concerned that the proliferation of private SAT preparation courses is sending an implicit message that those with more resources to buy additional training have greater advantages and subsequent life chances (Marlantes, 1999). Overall, there is a concern that the proliferation of PSI markets will further widen the educational and economic gap between society's "haves" and "have nots" (Walsh, 1999b).

Use of Remedial PSI is Also Increasing in the United States

Even before the NCLB Act became law, the use of PSI for remedial purpose was a common practice among families and schools in the United States. Students received this type of PSI to improve their performance in specific subjects that they had difficulties with. The emphasis was on understanding subject matter better, improving grades, and raising tests scores. Assistance often took the form of help in doing homework or the acquisition of study skills, and could be provided through individual-based tutoring, group lessons, or correspondence, such as the Internet (see Table 1.2 in Chapter I.).

There has long been a so-called retail tutoring market, according to Gorman (2004), which mostly serves well-off suburban children. Although the exact scope of the industry is unknown, economists estimate that providers take in roughly $2 billion per year.[19] Providers in the retail tutoring market are mixed in nature: some are regional or national providers such as Sylvan Learning Centers, while others are small, local companies and individuals offering tutoring services (Gorman, 2004; Rusch, 1999).

Popular media has been covering how parents concerned with the academic performance of their children are eagerly using these private tutoring services (Herszenhorn and Gootman, 2004; Kalish, 2003; Rusch, 1999; Badie, 1998; Mullaney, 1998). Many of them report dramatic increases in the use of private tutoring in recent years. The National Tutoring Association, a professional association for providers of

[19] Since the industry is dominated by individual tutors and no reliable statistics are available, the estimate on the size of the market varies substantially from $1 billion to $5 billion a year (Mullaney, 2004). Another author estimated it as $8-10 billion in 2004 (Gordon, E., 2004).

tutoring, states that the number of individuals providing PSI has increased from 250,000 in 1998 to more than one million in 2003 (MacDonald, 2003).

Private tutors teach skills such as how to study for tests, take notes, and listen to teachers. They also teach organization and time-management skills (Alexander and Richardson, 1999). Locally distributed magazines provide parents with information on finding good tutors and their contact numbers (Shore, 2000). The influence of parents' exposure to PSI through local fliers and community newsletters cannot be underestimated, as these resources are often distributed at public libraries or local children's' stores for free, and are readily available to parents (Shore, 2000; Gedzelman, 2000; Channick and Edelstein, 2000). Additionally, although this is not within the scope of this paper, some school districts have contracted private tutoring firms to provide instructional services to students who are failing academically (Gorman, 2004; Hamilton, 1998, "Letting in the light," 1998, White and O'Connor, 1999).

Supplementary Instruction Adopted by NCLB

As explained in Chapter I, the NCLB Act provides opportunities for students in underachieving schools to receive supplemental educational services to increase their academic achievement. Although the supplementary services provided through NCLB are beyond the scope of this study, the provision and forms of these services underscores the potential importance of PSI in understanding the educational outcomes in the United States. Under NCLB provisions, services may include academic assistance such as tutoring, remediation and other educational interventions, and must be provided outside the regular school day. The services must be of high

quality, research-based, and specifically designed to increase student academic achievement (U.S. Department of Education, 2003, Title 1, Section 1116(e)).

Under NCLB, each state must establish a definition of "adequate yearly progress (AYP)," which is then used to evaluate the performance of each school and school district in the state. School districts must identify schools that fail to meet AYP requirements for two consecutive years. All students from low-income families who attend Title I schools that are in the second year of school improvement, (i.e. the schools that have not made AYP for three years), in corrective action, or in restructuring, are eligible to receive supplemental educational services.[20] In other words, parents of disadvantaged children who go to failing public schools can acquire supplemental educational services as part of the NCLB requirements (U.S. Department of Education, 2003, Title 1, Section 1116(e)).

Private tutoring firms view this as an opportunity to enter the education market (Trejos, 2004; Borja, 2004). Not surprisingly, this portion of the law has attracted a good deal of attention from the popular media (Fletcher, 2001; Anderson, 2001; Alvarez, 2001). An expansion of the use of the tutoring provision included in the NCLB Act can be inferred from the reports of private providers. Catapult Learning (formerly Sylvan Education Solutions) and Platform Learning both reported that they quadrupled the size of NCLB-related business between the 2002 -2003, and 2003-2004 school years, while Huntington Learning Center also expanded the number of students enrolled under the law, reporting a ten-fold increase in the number of students served compared to the previous school year (Reid, 2004).

The potential impact of the provision of supplemental educational service has also gradually begun to receive attention in academic circles. Some education

[20] Title I (Section 116(e) states that if funds are insufficient to provide supplemental educational services to all eligible students, priority must be given to the lowest-achieving eligible students.

researchers worry about possible negative effects that the provision could have on poorly performing schools. Sunderman and Kim (2004) argue that "supplemental services shift the focus from improving poorly performing schools to improving individual student achievement, but only for those requesting services (p.5)." They conducted a study to examine the implementation of the supplemental educational services provision in the NCLB Act in 11 urban districts. From a civil rights perspective, they argue that it is important to understand the potential consequences of this provision for minority and low-income students, since its effects on student learning are untested. They have found that, while 20-25% of students in the selected districts that they surveyed were eligible for receiving supplemental educational services, the percentage of students that actually used the services during the 2002-2003 school year was substantially lower, between 1% and 18%. Because the Act does not provide districts with resources to administer, monitor, and evaluate supplemental educational services, Sunderman and Kim conclude that this provision, while under-utilized, still imposes substantial administrative and financial burdens on school districts that enroll large minority and low-income populations of students. Even in the school year 2003-2004, the national level of participation of eligible students in 2003-2004 in supplemental educational services was 19% (GAO, 2006).

Others, however, are more optimistic. Hess and Finn Jr. (2004), for example, have found that many school district officials view the use of supplemental educational services more favorably than transferring students to other higher performing schools as a tool for improving student performance.[21] Unlike Sunderman and Kim, Hess and Finn argue that the provision for supplemental educational services is more promising since it is easier to implement than school choice, and it

[21] NCLB gives students who go to failing schools several options to use Title I funds: to transfer to a higher performing public schools or receive supplemental educational services.

meets with less resistance from local educators since the schools can maintain control of the federal funds as well as keep their students.

As the NCLB Act moved into its third year in 2005, states were required to evaluate the effectiveness of supplemental educational services provided under the Act. Many states, however, lacked the capacity or resources to collect more comprehensive data about the provision of supplemental educational services and whether these services were actually improving the performance of students (Gewertz, 2005; Hess and Finn, Jr., 2004). Prior to 2005-2006, monitoring of supplemental educational services by states was quite limited (GAO, 2006). NCLB reauthorization is scheduled to take place in 2007, and the discussion on the implementation and monitoring of supplemental education services is expected to continue. The data collection and reviews of supplementary service use started to expand in the 2005-2006 school year, but many districts still face challenges in evaluating the use of these services (GAO, 2006).

Concerns for Remedial PSI – Unproven Effects and Equity Implications

While research that examines the use of PSI on student achievement is very rare, there are some studies that investigate the effects of academically oriented out-of-school-time programs sponsored by schools in collaboration with outside organizations. The evidence regarding the results on student outcomes is mixed.

Hock, Pulvers, Deshler, and Schumaker (2001) conducted an experimental study to examine the effects of tutoring on at-risk students – students who are currently failing two or more academic courses. The study found that at-risk students could earn average or better grades on tests if they had the support of trained adult tutors, and they could also acquire valuable learning strategies about how to learn

more effectively and perform more successfully while working on their class assignments.

A national study examined the effects of elementary and middle school after-school programs in 41 school districts that received federal funding under the 21st Century Community Learning Centers program.[22] The study found that the after-school programs had limited impact on student achievement in most subjects. The one exception was in the area of mathematics for middle school students (U.S. Department of Education, 2002b).

In addition to the mixed results regarding the benefits of out-of-school-time programs, there are further concerns about how such programs might influence the educational opportunities for economically disadvantaged students. It has been found that private providers, as profit seekers, tend to concentrate their businesses and services in wealthy neighborhoods. As a result, students who might need remedial instructions the most, students from low-income families, may find it most difficult to access these services, even with the government subsidy provided by NCLB (Gewertz, 2004).

Historical Background When Analytical Data Were Collected

While it is important to examine the current status of PSI, it is also useful to succinctly illustrate how PSI was used in the early 1990s, when the data for this study was collected, and what the educational climate was back then. The preceding decades, the 1960s and 1970s, were characterized by the pursuit of equality – trying to equalize educational opportunities for the poor and minorities.

[22] The 21st Century Community Learning Centers programs aims to support, with federal funds, the creation of community learning centers that provide academic enrichment opportunities for children, particularly students who attend high-poverty and low-performing schools.

That political climate drastically changed in the 1980s, when political leaders shifted priorities from equality to efficiency and excellence. Both the Reagan administration (1980-88) and the Bush administration (1988-92) criticized public schools for their inability to maintain high academic standards. The 1983 report, *A Nations at Risk*, conveyed the image of the United States as educationally outpaced and economically threatened by its competitive countries. *America 2000*, an educational pamphlet published in 1991, set goals with high academic standards, such as an increase in the high school graduation rate to 90%, or a top worldwide ranking for U.S. students in mathematics and science. At the same time, the Reagan and Bush administrations were questioning the benefits of affirmative action programs, which aimed to increase the representation of minorities allegedly seeking to redress discrimination, such as in college admission. It was the period that witnessed a resuscitation of a conservative and market-oriented philosophy that also called for a greater role of the private sector in many government activities, including education.

It seems obvious that the value of education in the 1990s when the NELS data were collected was linked with the increase in competitiveness of individuals (workers) and economic success of the nation – a thinking that fits well with human capital theory. While there does not seem to exist detailed explanations of how PSI was used during this period, some said the use of PSI, particularly academic coaching, was already proliferating (Becker, B. J., 1990).

Studies on PSI from International Perspective

Studies that examine the use and effects of PSI in countries other than the United States are more prevalent, an indication of how internationally widespread the use of PSI is outside of this country. Most of these studies do not provide

international comparisons but look instead at the status and effects of PSI in a single country. In this section, both comparative studies and individual country-based case studies are reviewed. It is hoped that an examination of PSI use in other countries will provide a valuable perspective to address the use and effects of PSI in the United States.

Worldwide Trend of Proliferation of PSI

As is the case in the United States., the media has been reporting the increase in the use of PSI in many parts of the world, such as New Zealand (Bedford and Hawkins, 2001), the United Kingdom ("Private pursuits," 2001), Korea (Ihlwan, 2000), Canada (Davies, 2002), China, Viet Nam, and Singapore (Bray, M., 2000). The use of PSI is already prevalent in such countries as Taiwan, Greece, Japan (Stevenson and Baker, 1992), Mauritius, and Malaysia (Bray, M., 2000),

Comparative Studies

Some of the studies for which researchers employ relatively rigorous analytical methods are the comparative studies that examine issues related to PSI across countries. These studies often examine the use, effects, and equity implications of PSI, highlighting differences and similarities across countries.

Use and Effects of PSI from Comparative Perspective

Pointing out that students among the top-ranked countries in international studies for mathematics achievement are also heavy users of PSI, and that PSI possibly contributes to the variation of achievement scores across nations, Baker and colleagues, (2001) conducted an international comparative study on the effects of the

use of PSI on the mathematics achievement of middle school students (7th and 8th graders) among 41 countries, including the U.S. Their study is one of the few aimed at empirically analyzing the state of PSI across countries. They test several hypotheses concerning the origin, persistence, and characteristics of *shadow education*, a term they use to indicate that this form of learning activity parallels or "shadows" features of formal schooling.

They found that the use of shadow education is widespread worldwide, although there is considerable variation among countries in the magnitude and pattern of its use. Of the entire sample of international students, 39.6% of students regularly participated in shadow education activities to improve their mathematics performance. However, contrary to the belief held by many that PSI programs worldwide are mostly enrichment programs (defined as advancement programs in my study), Baker and his colleagues found that participation in remedial programs was more prevalent in the countries that they examined. Their findings also indicate that the use of shadow education is not related to the presence of high-stake testing, but that it is negatively related to the level of public expenditure on education (measured public education expenditure as a percentage of GNP) and the gross enrollment ratio.[23] They interpret the latter finding to mean that shadow education is a market reaction to the under-development of public education in a country, as indicated by lower levels of funding and lower levels of eligible enrollment. The growth of shadow education, they argue, may result from unsatisfied demand and lower levels of confidence by parents in public education. Finally, according to their analysis at the national level, the use of shadow education is not related to the level of mathematics achievement in a country. Unfortunately, the definition of the variable used to measure the level of

[23] The gross enrollment ratio is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education (World Education Report, 2002).

shadow education in their analysis does not distinguish whether or not the instruction was provided privately or publicly.

While the study undertaken by Baker and his colleague did not find the effects of shadow education on student achievement, Fuligni and Stevenson (1995) report somewhat different findings regarding the benefits of PSI in their comparative study. They administered questionnaires and achievement tests to assess the effect of using PSI by 578 students in the 11th grade on their mathematics achievement in selected cities and countries: Minneapolis in the United States, Sendai in Japan, and Taipei in Taiwan. Fuligni and Stevenson report a wide range of PSI participation across the three cities, with 36% of Taipei students saying they were enrolled in after-school academic classes compared with 15% of Sendai students and 3% of the Minneapolis students. The effect of PSI on the mathematics achievement, however, showed mixed results. According to the findings of Fuligni and Stevenson, PSI use was positively related to achievement in Taipei students, but unrelated to achievement of the students in the other two cities.

Another well-known study of this kind in the international field is M. Bray's work (1999), in which he synthesizes reports on the status of PSI in both industrialized and developing countries. While the PSI data and information he collected came from various sources in each country, M. Bray has sorted and examined the data according to the categories that allow him to compare the aspects of PSI that he views important, such as scale, cost, geographic spread, intensity, subject, and types of producers and consumers. M. Bray also collected data on the educational, economic and social impacts of PSI use, as well as the various policy responses to PSI use. As explained below, according to M. Bray's findings, PSI use is proliferating in both rich and poor countries.

As for the scale of PSI use, M. Bray found that in some countries tutoring is a large enterprise that encompasses all or nearly all upper-grade students. In Mauritius, for example, almost 100% of secondary school students use PSI; in Malaysia, 83% of students use PSI by the time they reach high school; and in Japan, 70% of students use PSI by the time they finish middle school. Although M. Bray found that secondary school students tend to receive tutoring more intensively than elementary school students, he also found substantial growth of PSI use in the lower grades in several countries. In Japan, for example, the use of PSI by elementary school children doubled between 1976 and 1993, and in Singapore, use by elementary school children increased from 27% to 49% between 1982 and 1992.

Perhaps because of the market demands in some countries, PSI can cost a large amount of money in some countries. For example, in Egypt, PSI was estimated to consume 20% of total household educational expenditures in urban elementary schools, and 15% in urban secondary schools. Even in Cambodia, 7% of the total cost of elementary schooling was estimated to be spent on supplementary tutoring for children. Not surprisingly, several studies he reviewed revealed that students from higher socio-economic backgrounds generally received more supplementary tutoring than those in lower socio-economic groups. Use can also differ by ethnicity: in Malaysia, for example, while 63% of Chinese and 71% of Indian students received tutoring, only 39% of Malay students did so. Gender in most countries, however, shows no difference in terms of using PSI; male students are just as likely to use PSI as female students.

M. Bray also looks into the question of what is the purpose of PSI use, what are the most common subjects covered by PSI providers, and in which countries is PSI use most common. According to M. Bray, students who use PSI are often high-

achievers who want to maintain their competitive edge. Not surprisingly, therefore, subjects that get the most attention in PSI markets are ones most needed for educational and social advancement, such as language, mathematics, and science. Such PSI preferences are clear in Kuwait, Malta, Singapore, Sri Lanka, and Taiwan. Finally, M. Bray's review indicates that PSI use seems to be more common in urban areas, where there are higher concentrations of families with higher levels of socio-economic status, than in rural areas - a pattern of use especially evident in Cambodia, Greece, Egypt, and Taiwan.

Equity Issues

M. Bray (1999) contends that PSI seems to be a mechanism that maintains and possibly increases social inequalities, as evidenced by the aforementioned high costs of tutoring in some countries and differences by race and family income in the use of PSI. M. Bray also identifies other ways in which tutoring may create inequities, especially in countries such as Cambodia, where public classroom teachers are allowed to tutor students privately after school. If these teachers provide a higher quality of instruction after school, as has been reported in some countries, students who cannot afford after-school tutoring may fall behind their more fortunate peers.[24] Due primarily to a concern about social inequity, some governments have tried to ban private tutoring (e.g., in Cambodia, Mauritius, and the Republic of Korea), although these bans tend to be ineffective because governments are seldom able to enforce them (Bray, M., 1999).

[24] M. Bray (1999) states that the cases of teachers teaching the same students in the regular classroom and in private sessions are found in Cyprus, Cambodia, Indonesia, Lebanon, Nigeria and Russia. He does not mention the source of these observations.

Single-country Studies and the Proliferation of PSI

Several international studies have been conducted to demonstrate how widely the use of PSI has become in particular countries. Some studies also examine the effects of PSI use on educational outcomes and educational equity. These more focused studies provide a more in-depth profile of PSI use than the comparative studies and, in some instances, highlight important exceptions to the general trends identified by cross-national studies. Because I reviewed the existing U.S. studies in the previous sections, I focus on studies of PSI use outside of the United States.

PSI Use in Non-U.S. Countries

As seen in the comparative studies, the use of PSI is widespread in the world regardless of the level of economic development of the country. Stevenson and Baker (1992) examine longitudinal data about the effects of PSI use by Japanese high school seniors at two points in time: (1) the first year out of high school (all students with college plans in the base-year sample), and (2) second year out of high school (students who have college plans but did not attend college after high school in the follow-up sample). The data contain such variables as whether or not these high school seniors participated in practice examination sessions (provided by private firms), subscribed to correspondence courses, hired private tutors, or took after-school classes.

They found Japanese families to be voracious consumers of PSI: 88% of students who were planning to attend college participated in at least one of the surveyed PSI activities, and 60% of these same students participated in two or more of these activities. Stevenson and Baker also looked into the background characteristics of students in relation to the use of PSI by running logistic regression

models, and found that wealthier families and families in which parents had higher levels of education were more likely to obtain PSI for their children. If students were boys, had better grades, were in academic curriculum tracks, and lived in urban area, they were also more likely than other students to use PSI.

Davies (2002) conducted a study of PSI use in Canada, where the number of tutoring businesses grew by 200% to 500% in major cities during the 1990s. As part of the study, he surveyed 501 Canadian parents about the use of PSI. Nine percent (9%) said that they were currently using PSI, 8% said that they used it in the past, and 47% said that they wanted to use it but could not afford the cost. He found that parents who used PSI had higher socio-economic status while parents who desired to use PSI (but felt that they could not due to its cost) had lower socio-economic status than those who expressed no desire to use PSI. The PSI users were also more involved in school activities and were less satisfied with public schools than non-users. PSI users also favored private school education more than non-users. In fact, Davies found that a preference for private education had the largest effect (holding other things constant) on the use of tutors by Canadian parents. Parents were four times more likely to hire tutors for their children if they favored private schooling.

Effects of PSI Use in Non-U.S. Countries

Additional studies that look at the effects of PSI in countries other than the United States show modest to weak relationships between the use of PSI and student achievement. Single-country studies summarized by M. Bray (1999) demonstrate how varied the effects are of private tutoring on student learning across the studies. In Mauritius, a path analysis conducted by Kulpoo (1998) shows that the use of supplementary tutoring was positively related to the level of reading literacy of 6th

graders. In Greece, a path analysis conducted by Polydorides (1986) that examined determinants of high school students' GPAs shows a small positive relationship between tutoring and achievement as measured by GPA. But in a separate analysis, achievement as measured by scores on a national examination shows a small negative relationship. In Egypt, the analysis of 18,000 primary students by Fergany (1994) indicates no relationship between student achievement and the use of private tutoring.

Stevenson and Baker (1992) also examined whether participation in PSI by high school students in Japan increases a student's chances of attending a university, while controlling for other student, family, and school characteristics. They found that the use of practice examinations and correspondence courses are positively related to the chances of entering a university. Using a tutor, however, somewhat decreased a student's chances of attendance, which may reflect the remedial character associated with the use of private tutors in Japan. The use of private after-school classes had no significant effect on university attendance. Because the best high schools often offer their own after-school programs for college entrance preparations, this form of PSI participation may be less influential in Japan than in other countries.

Why PSI? Use of PSI and Human Capital Theory

So far I have reviewed the literature concerning the status of PSI use – in terms of advancement PSI designed to help students get into better colleges and remedial PSI aimed at helping students with their academic struggles - both in the United States and abroad. However, some important questions remain. Regardless of whether their academic goals are remedial or advancement in nature, why do students and their families choose to spend money on PSI? And after using PSI, are students and their families getting positive results, such as better achievement scores or the

enhanced likelihood of admission to better schools? To address these questions, I have chosen to use human capital theory as the theoretical framework for my study, since the theory seems to offer an explanation for why people are using PSI and what might be the results of doing so. I see the use of PSI as fitting well into a category of investments defined by human capital theory – that is, an investment in individuals with the hope of gaining access to more beneficial educational opportunities and higher earnings in the future. As I will demonstrate, the literature on human capital is consistent with this line of thought.

Human Capital Theory

People often view education as an investment in themselves or their children, expecting it to bring some kind of higher return in the future – such as entering into better colleges or getting better jobs. Such human behavior is explained as human capital theory - which states that just as people make investments in physical capital, we also make investments in ourselves – human beings – through a variety of education and training experiences aimed at increasing our capabilities and efficiencies. (Langelett, 2002; Becker, G. S., 1993, 1962; Schultz, 1977, 1961).

As stated in Chapter I, while the human capital investment takes place at the individual level, it also has hypothesized macro-level effects. It has been theorized that the formation of human capital by individuals eventually improves the overall quality of the labor force. As the skills and knowledge of current and future workers are enhanced through education and training, there is an increase in economic productivity and eventually the economic growth of the country. (Langelett, 2002; Becker, G. S., 1993, 1962; Cohn and Geske, 1990; Schultz, 1977, 1961; Weisbrod, 1971). Therefore, in modern governments that adopt a human capital perspective,

concerns about economic growth often involve policies directed at improving human capital through education and training. Private firms also often support the policies that encourage the development of human capital, anticipating that such investment would provide them with a better-skilled workforce.

An awareness of the possibility of human capital and its contribution to the economic welfare of nations already existed in late 17th centuries (Kiker, 1971). The Scottish economist Adam Smith stated in his famous book, *The Wealth of Nations*, that investments in workers can be viewed similarly to investments in machines or instruments (Smith, 1937). However, neither Smith nor other scholars who showed an interest in human capital theory developed this perspective or provided strategies for correctly estimating the effects of investment in human capital. It was not until the early 1960s, when a U.S. economist, Theodore Schultz, attempted to explain the mystery associated with U.S. productivity and growth, that significant advancements in human capital theory took place.

The U.S. economy was showing an unprecedented increase in national productivity and growth, and such an increase in national output was proportionally larger than respective increases in three key inputs to production, as defined in classical theories of economics - land, labor (man hours), and the stock of reproducible capital. Schultz (1971) tried to prove that it is human capital – the improved quality and productivity of human labor – that explains this gap and greater–than-expected economic productivity. As production becomes more dependent on technological advancements, it also becomes more dependent on a higher quality labor force that can handle more complex technologies. Moreover, these more technologically capable workers will be in greater demand and will receive greater rewards than less technologically capable workers. Schultz contends

that "investment in human capital accounts for most of the impressive rise in the real wage per worker (p.25)." Thus investment in human capital benefits the nation by improving the productivity of its labor force, and rewards individuals with the possibility of earning higher wages through investments in knowledge and skills.[25]

Nobel Prize Laureate Gary S. Becker (1993), working at roughly the same time as Schultz, further promoted and expanded the theory of human capital. "Education and training are the most important investments in human capital (p.17)," he declares in his book, *Human capital: A theoretical and empirical analysis, with special reference to education* (third edition), which was originally published in 1964. G. S. Becker states that countries that have achieved sustained growth also realized a large increase in the education and training of their labor force, referring specifically to such Asian countries as Japan and Taiwan. He argues that despite the scarce availability of natural resources in these countries, Japan and Taiwan generated impressive gains in economic growth by investing in people. Together with Shultz, G. S. Becker developed the theory of human capital and presented strategies for estimating the contribution of education to individual incomes and the economic growth of nations.[26]

[25] Human capital theorists have developed methods to quantify the benefits and costs of an educational investment and evaluate its economic return, known as cost-benefit analyses. In doing so, they use such analytical approaches as net present value (NPV) and internal rate of return (IRR). Since this study does not use such techniques, they are not elaborated here.

[26] Human capital theory does not escape from criticisms. One of the well known arguments from the neoclassical economic viewpoint is the screening (credentialism) hypothesis which views that education provides a sorting process for potential employers to select employees. In this view, education does not necessarily make workers more productive, but the workers still earn higher wages since those selected with certain education posses the attributes sought by employers (Cohn and Geske, 1990; Langelett, 2002). Another argument comes from political scientists affiliated with neo-Marxist framework who view that human capital theory ignores the relevance of power and class conflict in the capitalist society. Education is a vehicle by which the wealth of upper class is transmitted across generations, and wage differentials are caused by family background or social class (Bowles and Gintis, 1975).

Use of PSI and Human Capital Theory

As mentioned in Chapter I, Shultz cites five examples of education and training that can improve human capabilities, and thus result in higher qualities of human capital: health services, on-the-job-training, formal education (K-12), adult education, and migration to seek better employment opportunities. He does not mention out-of-school-time learning activities, such as PSI, as a strategy for enhancing human capital. Perhaps the use of PSI in the 1960s was not as evident as it has become these days.

In the literature I reviewed, however, researchers often either implicitly or explicitly rely on human capital theory to analyze the state and consequences of PSI use. Such thoughts seem to be shared not only among scholars who examine the issues of PSI, but also among families who are using PSI and even some governments that promote PSI. For example, M. Bray who analyzed the state of PSI in different countries (1999) contends:

> Advocates of human capital theory might consider supplementary tutoring to be even more tightly related to economic enhancement, because it is closely tied to the demand of the marketplace and because the enhanced economic return is among the chief reason why pupils and parents invest in it (p.65).

Stevenson and Baker (1992) also see a relationship between human capital theory and the proliferation of PSI in many countries. They argue that PSI is prevalent when there are tight linkages between the outcomes of education in elementary and secondary schools and future educational and occupational opportunities in the countries. Baker and colleagues (2001) concur, seeing evidence

in the nations that they studied that the use of PSI is in part a market reaction to intensified competition for further educational and labor market opportunities.

Articles in the popular media that feature PSI often carry interviews with the users, and it is evident that parents have a view consistent with human capital theory, even though they probably know little about the theory itself. The parents of PSI users seem to believe that using PSI will bring better returns for their children in the future – thus PSI for them is an investment in their children. For example, asked why she is seeing a private tutor, a U.S. middle school student explains:

> I just wanted to get all As. They are important to get into good high schools, a good college, and good jobs" (Mullaney, 1998, p.W.18)

In Korea a parent whose child saw a private tutor contends,

> Education was not for its own sake, one of my neighbors told me. He wanted to be sure that his son, who then was in elementary school, could get into a good college and get a good job. (Casey, 2000, p.B02)

Current users of academic coaching, especially as evidenced by the marketing of test preparation programs, clearly hold the view that gaining extra academic help will increase their chances of acquiring admission to better colleges, so they too are investing in PSI for "better returns" in the future.

Government leaders and policymakers who make statements supportive of PSI use also find their rationale in human capital theory, as they often argue that the development of human capital benefits individuals as well as societies. M. Bray (1999) sees such a view in policies concerning PSI in multiple countries. The Singaporean government, for example, supports private and non-profit tutoring

organizations by allowing and even encouraging schools and students to spend government subsidies to purchase PSI provided by these organizations.

In the United States, those who developed the concept of NCLB, which contains a provision for publicly subsidized PSI use, seem to have the idea of human capital development as a basis for the policy. We do not need to look further than the foreword by President Bush (2001) in the Act:

> The quality of our public schools directly affects us all as parents, as students, and as citizens. Yet too many children in America are segregated by low expectations, illiteracy, and self-doubt. *In a constantly changing world that is demanding increasingly complex skills from its workforce* [italics added]**,** children are literally being left behind. (foreword).

Aspirations, Satisfaction, and Human Capital Theory

How could the level of educational aspirations or academic dissatisfaction with school contribute to the decision to use PSI in the context of human capital theory? Baker and colleagues argued that the use of PSI is a means for people with higher educational aspirations to buy educational advantages (2001). To make an investment, individuals make plans, and the level of expectations should reflect these plans (Morgan, 1996). There seems to be a strong conviction among parents and students that attending a good college confers remarkable future advantages (Schwartz, 1999). Also, if the education system or children's school is considered to be of poor quality, private tutoring might be considered as alternative (Baker, D, Akiba, LeTendre, and Wiseman, 2004; Davies, 2002; Ireson, 2004). All in all, educational aspirations and satisfaction can drive people to seek such an investment as PSI in the context of human capital thinking.

Investment in Human Capital, Student Outcomes, and Wage Differentials

This study examines the effects of a form of educational investment, PSI, on the student outcomes of achievement and attainment (college acceptance). Then, what does increase in such outcomes mean in terms of raising their labor market value – wages – one of the important objectives of the investment in the framework of human capital theory?[27] On one hand, the relationship between the test score and wages are less clear. Some argue that test cores are not strong predictors of students' success on the labor market (Card and Krueger, 1996) while others found that mathematics test sores are significantly and positively related to earning (Murnane, Mullet and Levy, 1995),.

On the other, there seems to be an agreement that additional years of schooling lead to higher level of earnings (Becker, G. S., 1962; Card and Krueger, 1996; Hanushek, 1994; Tyler, Murnane, and Levy, 1995), as summarized in the statement made by Card and Krueger (1996) that "the findings that average earnings are higher for individuals with more schooling is one of the most strongly established facts in social science (p.104)." Therefore, it seems to be viable to infer that if the investment in PSI is found to be linked with higher level of college admission, students who invest in PSI are more likely to earn higher wages eventually.

[27] While wages are often studied as an important benefit, other non-labor market benefits, such as family health, birth control, safety, and crime reduction are also viewed as an integral part of the benefits that can be increased by investment in human capital. Therefore, efforts have been made to quantify the effects of these benefits.

Summary

In this chapter, I have reviewed a broad and amorphous literature about PSI use in the U.S. and abroad, both in terms of PSI use for advancement and PSI use for remediation. I have focused especially on the literature in terms of PSI use, effects, and potential implications for educational equity and social inequality. To cover a topic that is complex and constantly evolving, I have explored a wide range of sources, from academic literature to the popular media. While there is considerable variation in how PSI is perceived and used throughout the world, a few things seem to be common: the use of PSI is expanding both in the United States and in many other countries; the effects of using PSI on student outcomes (student learning) have shown mixed results or have been undetermined; and there are certain concerns about the proliferation of PSI use and its implications for educational equity.

I have also touched on some of the key literature in the area of human capital theory, the theoretical framework within which I develop my conceptual and analytical models. Such a framework is consistent with how policymakers, researchers, and users characterize PSI use, and it may help to explain why people are using PSI and what sorts of outcomes should be explored as a consequence of PSI use. In the next chapter, I will describe the data for analysis and analytical method to explore the use of PSI among U.S. high school students, utilizing human capital as a theoretical perspective.

CHAPTER III: DATA, SAMPLE, AND METHODS

Introduction

In this chapter I discuss the data that I plan to use for the study, including the source and characteristics of the data and their advantages and limitations for the purposes of my study. I also describe the measures that I plan to use in my analyses, the selection criteria or filters that I use in determining my analytical sample, and the type of analytical methods that I intend to use in addressing my research questions.

Description of Data

Source of Data

For my analysis I use data from the NELS of 1988, a large nationally representative longitudinal study sponsored by the National Center for Education Statistics (NCES), at the U.S. Department of Education. The general purpose of NELS is "to study educational, vocational, and personal development of students at various grade levels, and the personal, social, institutional, and cultural factors that may affect that development" (U.S. Department of Education, 1994, p. 1).

NELS data were collected using a two-stage clustered and stratified probability sampling design. In the first stage, 1,052 schools that enrolled eighth graders, both public and private, were selected out of about 39,000 eligible schools nationwide. The schools were selected with probabilities proportionate to their estimated enrollment (assuring a nationally representative sample of schools by size). To represent small, policy-relevant subgroups more accurately in the dataset, the

sample was also stratified to permit over-sampling by school type (private vs. public), region of the country, urbanicity, and percentage of minority enrollment.

In the second stage of sampling, an average of 26 students were selected randomly from each school. The final student sample comprised 26,432 eighth-grade students, including non-respondents. NELS base-year data contain information from not only students but also from students' parents, two of their teachers, and their school principals. Sample weights included in the NELS dataset adjust for the stratified sampling design and potential non-response bias.

In 1990, the NELS survey staff conducted a follow-up survey with students, most of whom were 10th graders, as well as two of their teachers and high school principals (the first follow-up). They were able to trace 25,988 students attending 3,967 schools after excluding students outside the sampling parameters (e.g., students not on grade or students no longer in the U.S. education system). In 1992 the staff was able to survey 18,726 students who were attending 3,224 schools, mostly 12th graders, from the original sample along with their parents, teachers, and principals (the second follow-up). Since 1992, NELS has conducted two additional follow-up surveys, one in 1994, two years after students had graduated, and again in 2000, eight years after students had graduated from high school.[28]

Advantages of the Data

There are several reasons that I chose to use NELS for this study. First and foremost, NELS is the only nationally representative dataset that includes sufficient information for my study about the use of advancement and remedial PSI by

[28] The NELS dataset also includes a sample of students who dropped out of school between the 8th and 12th grades, but these students are included in a separate dataset and are not part of this study.

secondary school students in the United States. Questionnaire items included in the base-year and second follow-up surveys asked students and parents about PSI use for advancement and remedial purposes (e.g., test preparation and tutoring). NELS also includes information that allows me to identify independent and dependent variables related to human capital theory and my analytical models.

Second, the NELS dataset contains rich and varied information about students' beliefs and educational experiences, as well as the beliefs and educational backgrounds of their parents. These data enable me to account for various factors that may influence the use and effects of PSI in building my analytical models, such as the possible reasons for PSI use and the possible contextual factors that might limit access to PSI for specific student populations. The NELS data permit the development of more robust analytical models that are capable of considering alternative explanations for any relationships between PSI use and specific student populations.

Third, NELS includes a battery of subject-specific achievement tests, which were curriculum-sensitive and designed to measure students' cognitive status and change in status at each wave (8^{th}, 10^{th} and 12^{th} grades). It also includes information about student enrollment in various types of post-secondary institutions two years after high school graduation. The longitudinal nature of the data allows me to examine potential consequences of PSI use on the student outcomes over time, such as whether student achievement increased across several years or whether students were accepted by post-secondary institutions after graduating from high school. Without these data it would not be possible to explore the potential "short-term" returns to students and their families that might accrue (or fail to accrue) from investments in PSI.

Limitations of the Data

While NELS is a source of rich and useful data for my analysis, there are some noteworthy limitations. NELS is a general-purpose survey and is not designed specifically for the purposes of my study. While NELS certainly asks parents and students about their use of PSI, there are only three variables in this category that are relevant to my study (see Appendix 1). These questions were specific enough to determine whether out-of-school-time instructional services were privately provided, and if the nature of the instruction was advancement or remedial (a distinction which is often unclear or unavailable in other studies or datasets). It would have been useful, however, if additional survey items about the duration, exact costs, and quality of services had been included in the dataset so that I could have built an even more well-defined set of variables about PSI use.

Another limitation of NELS is that the relevant data are roughly 13-15 years old. The data used in this study were collected between 1992 and 1994. These data may not reflect more recent developments such as the implementation of new policies that promote public support for PSI use (e.g., the NCLB Act). Although NCES has launched a new national study of high school students, the Education Longitudinal Study of 2002, this survey data do not include information about several key variables used in this study (e.g., use of remedial PSI or college enrollment). Consequently, despite some limitations NELS remains the only nationally representative dataset that includes sufficient information about PSI use, high school experiences, and post-secondary outcomes to address the research questions for my study.

Measures

In the following sections I explain the measures I am planning to use for examining each of my research questions. See Appendix 1 for more a detailed explanation about the variables used in this study, including the actual variable names and descriptions as they appear in the public-use NELS dataset.

Reasons for the Use of PSI

To examine the reasons why some students use PSI and others do not, I make a distinction between personal (internal) reasons and contextual (external) reasons. I identified two constructs consistent with human capital theory and the literature as personal reasons for using PSI: educational aspirations and academic satisfaction with school. I also identified two constructs as underlying potential contextual reasons for using (and not using) PSI: affordability (income) and accessibility (geographical location).

Personal Reasons – Educational Aspirations

I use a composite variable based on student and parent survey responses to tap educational aspirations. The items included (a) the level of education that students said they wanted to attain; (b) the level of education that parents said they wanted their child to attain; and (c) whether or not students and parents indicated that they were discussing post-secondary education plans (e.g., applying to college or preparing for entrance examinations such as the SAT or ACT. I use factor analysis to create the composite (M = 0, SD = 1). These data are all from the12th grade student and parent surveys. Because of when these data were collected, they should reflect students' and parents' immediate desires, expectations and concerns about what students would do

after graduation, including future plans for post-secondary education. Students and parents with higher academic aspirations are expected to be more likely to report the use of PSI.

Personal Reasons – Academic Satisfaction with School

A composite variable is also used to measure the level of satisfaction that parents hold for the educational opportunities being offered to their children. This composite includes information from various item on the parent survey about the school attended by their child, such as parents' beliefs about: (a) the way school sets priority for leaning; (b) the quality of homework assignments; (c) the academic standards set at their child's school; (d) the way the school is preparing students for college; and (e) the quality of teaching. I used factor analysis to create the composite (M = 0, SD = 1). The data are all from 12^{th} grade parent surveys, and should reflect parental views about whether or not they are content with the quality of education that their children are getting at school. Note that NELS only asks parents, not students, about satisfaction-related questions, but parental opinions should be important since it is parents who have to bear the cost should they decide to have their children use PSI. I predict that the less satisfied parents are with the educational opportunities afforded to their children at school, the more likely they turn to use PSI.

Contextual Reasons – Affordability (Income) and Accessibility (Geographical Location)

The issue of affordability is addressed by using a variable that measures the level of family income reported by parents as part of the 1992 follow-up survey (when

students were 12th graders). The survey asked parents to indicate, by roughly equal categories, their level of income. I treat this measure as a continuous variable in the analysis, and I consider it to be a proxy for the level of disposable income that can be used for a child's private instructions. I assume that the more income parents have available to them, the easier it is for them to use PSI.

Accessibility is measured using a variable that indicates the location of the school that students were attending in the 12th grade (urban, suburban, or rural). This is a proxy variable for geographical location and students' access to PSI providers. Many sources report that families are more likely to have access to PSI if they live in wealthy suburban or urban areas than in rural areas (Gewertz, 2004; Gorman, 2004, Medler, 2004; Richard, 2005). I dummy-coded each variable for this measure (e.g., living in rural, yes = 1, no = 0).

Use of PSI

The NELS data include information in the student and parent surveys about the use of PSI between the 10th and 12th grades. These variables allow me to distinguish some characteristics of PSI that are important to my analyses, including: (a) if the PSI is privately provided or not; and (b) if the type of PSI is advancement or remedial. I use these measures of whether students use remedial and advancement PSI as dependent variables in the first part of the analysis and as the primary independent variables in the second half of the analysis.

The remedial PSI variable is made using a NELS survey item that asked students if they had paid someone outside their school to help them with homework

during the last two years.[29] I dummy-coded students' answers to this item for my analyses (used remedial PSI, yes = 1, no = 0). The advancement PSI variable is made using two NELS survey items that asked students: (a) if they took courses offered by a commercial test preparation services to prepare for the SAT/ACT, and (b) if they received private one-on-one tutoring to prepare for the SAT/ACT. I coded any student who answered yes to either item as receiving advancement PSI within the last two years (used advancement PSI, yes = 1, no = 0).

Student Outcomes

Although one of the ultimate benefits of PSI use from a human capital perspective is an increase in earnings, short-term or intermediary benefits might also be examined as predictors of future earnings. In this study I consider two types of intermediary benefits or student outcomes: achievement (achievement gains in mathematics) and attainment (four-year college acceptance). Murnane, Willet, and Levy (1995), for example, found mathematics test sores to be significantly and positively related to future earnings, and many researchers (e.g., Becker, G. S., 1962; Card and Krueger, 1996; Hanushek, 1994; Tyler, Murnane, and Levy, 1995) have documented a strong and positive relationship between educational attainment and wages. I assume that if investments in PSI are linked with higher levels of mathematics achievement and college acceptance, then students who invest in PSI gain an intermediate benefit that enhances their likelihood of higher wages.

Achievement gains are measured as the difference between 10^{th} and 12^{th} grade achievement scores in mathematics. The NELS tests are constructed to allow data

[29] Due to the way survey questions are asked, the use of remedial PSI does not specify which subject matter was covered. Therefore, there is a possible misalignment concerning the relationship between the use of remedial PSI (which may not be about mathematics) as an input and mathematics achievement as an output.

users to compare and accurately estimate achievement gains over time. I use a standardized version of the gain score in my analyses (M = 0, SD =1). College acceptance is measured on the basis of students' answers to the third follow-up survey, which asks students about the type of post-secondary institutions (e.g. private or public, two-year or four-year) that they attended between 1992 and 1994.[30] I coded any student who said that the first institution he or she attended was a four-year college as having been accepted (acceptance by a four-year college, yes = 1, no = 0).

Control Variables

To conduct analyses on the relationships of (a) if or how personal or contextual reasons can affect a family's use of PSI; and (b) what are the effects of PSI use on student achievement gains and college acceptance, I include other factors that could influence these relationships. In selecting control variables, I considered model building strategies utilized in production-function studies, school effectiveness studies, and value-added studies. An underlying logic in all of these studies is how best to isolate the effects of some set of potential inputs or factors after controlling for related variables that might be confounded with a desirable outcome. Typical types of variables included as controls in these studies include measures of innate ability and prior achievement, student and family characteristics, and school organization and structure. Because there is very little empirical research that can be used to guide the selection of controls for this study, I have sought to select a series of variables commonly used in a broad range of education studies.

[30] The variable for college acceptance used for the study asked students about the type of post-secondary institution in which they were first enrolled (see Appendix 1). Therefore, the rate of college acceptance could be underestimated since it is quite possible that there were students who were accepted by four-year colleges but did not enroll themselves in such institutions.

Control variables used in the first and second set of analyses include measures of student's innate academic ability or prior achievement as measured by 10th grade mathematics achievement and 10th grade self-reported grade point average (GPA)[31]. Each measure is standardized for the analyses (M = 0, SD = 1). Other student characteristics included in the analyses are race and gender, which are dummy-coded. I also include measures of whether students took remedial courses or test-preparation courses in school (each dummy-coded, yes = 1, no = 0).[32] Family characteristics include parents' level of education (M = 0, SD =1) in both the first and second set of analyses, and geographical location, income, educational aspirations, and academic satisfaction for the second set of analysis (when achievement gains and college acceptance are the outcomes). In all of the analyses I include a set of dummy-coded measures to indicate school type (public, Catholic, or other private).

Analytical Sample

While I use the data from the base-year survey (1988), as well as the first (1990), second (1992) and third (1994) follow-up surveys from NELS, the focus of my study is on the second follow-up survey, which investigated the experiences of students as 12th graders. This is because the second follow-up survey has the most information regarding PSI. The base-year and first follow-up surveys are used primarily for identifying control variables or estimating values for missing data in the second follow-up survey. I use the third follow-up survey to identify information

[31] The analysis that examines the effect of use of PSI on mathematics achievement does not include a separate control for 10th grade achievement because I use a gain score (the difference between 10th and 12th grade mathematics achievement) for dependent variable.

[32] Variables of whether students took remedial courses or test-preparation courses in school, does not ask which subjects those courses covered. Since my model measures the effects of the use of PSI on mathematics achievement, there is a possibility of misalignment between these control variables and the dependent variable (mathematics achievement).

about whether students were actually enrolled in a post-secondary institution after they graduated from high school (my proxy measure of college acceptance).

Analytical Sample and Data Filters

The analytical sample is a large subset of the 8th grade through two-years after the 12th grade longitudinal panel from NELS. Using several data filters associated with missing data, I constructed my analytic sample to include cases that have no missing values for the key variables that I have identified for my analyses. First, I choose students who participated in all four waves of data collection: the base-year, the first follow-up, second follow-up, and the third follow-up. Second, I limited the sample to students who had data on key variables, such as the use of PSI (both advancement and remedial) and student outcomes (10th and 12th grade mathematics achievement and college acceptance). Third, I excluded special education students because these students may receive publicly supported supplementary instruction as part of their Individual Education Plans. Fourth, I eliminated a small number of Native American students and a relatively small number of students who reported using both advancement and remedial PSI due to their small sample sizes.

After using these data filters, missing data analysis was conducted to examine if there are any statistically significant differences in the key characteristics of the cases included in the analytical sample and those excluded from the sample. Table 3.1 displays means or percentages for some key characteristics of students in the analytic sample compared with students in the unrestricted longitudinal cohort (all eligible cases before applying the filters).

Table 3.1 Mean Differences between the Analytical Sample and the First Four Waves of the NELS:88 Cohort (1988-1994)[a]

		Analytical Sample		Longitudinal Cohort	
		7,613		10,758	
		n	Mean or %	*n*	Mean or %
Use of PSI					
Used advancement PSI	%	7,613	12	10,139	14
Used remedial PSI	%	7,613	5	10,420	8
Aspiration					
Expects finishing college or more (by parents)	%	6,819	83	9,421	82
Expects finishing college or more (by students)	%	7,563	73	10,448	68
Satisfaction					
Standards set by school is too low	%	6,677	20	9,224	20
School places high priority on learning	%	6,752	89	9,324	89
Affordability (Income)					
Family income	*m*	6,573	0.01	9,056	0
Accessibility (Geographical Location)	%	7,607	25	10,740	27
Urban			42		42
Suburban			33		31
Rural					
Student Characteristics					
Gender	**%**	7,613		10,758	
Male			50		50
Female			50		50
Race	**%**	7,613		10,757	
White			78		75
African-American			10		11
Hispanic-American			8		9
Asian-American			4		4
Prior Student Performance					
Prior level achievement					
Mathematics test score (10^{th} grade)	*m*	7,613	-0.06	10,758	0

a: *n*=unweighted. % is column percent.

These means are for independent variables and some key control variables that I use for this study. The first two columns present unweighted counts and either means or percentages for the analytical sample, while the next two columns present corresponding information for the full longitudinal cohort. The table identifies how the reduced analytical sample, derived using the case restrictions mentioned above, compares to the full longitudinal sample without case restrictions.

As shown in Table 3.1, the data filters resulted in a loss of roughly one-fourth of the cases in the full longitudinal sample. The analytical sample includes 7,613 students who were 8th graders in 1988, attended public, private, or Catholic schools during 1990 and 1992, and stayed in the NELS study in 1994, two years after high school graduation. A slightly higher percentage of students in the analytical sample expect to finish college compared to students in the full sample (73% v. 68%), though students in the analytical sample also have slightly lower levels of 10th grade mathematics achievement than students in the full sample (-0.06 SD v. 0.00 SD). All of the other characteristics are either exactly the same or within three percentage points. Although the characteristics of students in the analytical sample are not identical to those of the students in the full sample, all of the differences, with the possible exception of student aspirations and prior achievement, are negligible. Table 3.1 does not indicate that the use of the data filters creates any specific biases that would undermine the external validity of the study.

NELS also provides the design panel weight that adjusts for over-sampling students with special characteristics, such as minority students or those who go to private or Catholic schools and urbanicity. The analytical sample for this study is adjusted using the student panel weight covering all four waves of surveys (1988-1994, 8th grades through two years after high school graduation) that I use for my analyses, after normalizing the weight for the students in the sample. Using this weight helps me to identify the parameters for the external validity of my analyses – namely, that my findings can be generalized to students who were 8th graders in 1988 and who graduated from high school in 1992.

Research Questions and Methods of Analysis

My analytical model presented in Figure 1.2 in Chapter I explores two central questions: (a) what are some potential reasons for using (and not using) PSI by high school students and (b) what are the effects of the use of PSI on student outcomes. More specifically, question (a) can be stated as "does the level of educational aspirations or academic satisfaction influence the use of PSI?" and (b) as "does the use of PSI affect student outcomes (achievement and attainment)?" The analyses addressing these two central questions build on each other, with the dependent variables in the first set of analyses (question a) included as independent variables in the second set of analyses (question b). The analyses are conceptually nested in the human capital theory with the first addressing possible reasons for an investment and the second set possible benefits from these investments.

Depending on the nature of the questions and type of variables used, I employ different statistical methods to address each question. I explain these methods in the following sections. My intention here is not to provide technical details for each set of analyses but to present sufficient information so that the reader has an overall understanding of the analytical approaches I use to address my research questions.

Profile of the Users of PSI (Descriptive Analysis)

Before starting more complex analyses to address my research questions, I examine the background characteristics of PSI users to determine, how, if at all, PSI users differ from non-users of PSI. I consider possible differences between those who use PSI and those who do not for both advancement and remedial purposes. In my analytical sample, about 5% of 12th graders responded that they used PSI for remedial purposes, while 12% used PSI for advancement (SAT/ACT preparation) purposes.

Overall, 17%, or roughly one out of six high school students, used some form of PSI in 1992. It should be noted that I excluded students who used both advancement and remedial PSI from the analytical sample because these students represented a relatively small number of students and I wanted to be able to maintain a distinction between advancement and remedial PSI users throughout all of my analyses. Therefore, the proportion of students who used PSI was somewhat higher than 17%.

I investigate possible relationships between PSI use and other variables in the study with Chi-square statistics for categorical variables and independent-sample T-tests for continuous variables. I examine following simple bivariate relationships to see if remedial PSI users, advancement PSI users, and non-users of PSI are significantly different in terms of: level of educational aspirations, academic satisfaction, income, geographical location, gender, race, use of supplementary instruction at school, parental education, school type, 10^{th} grade mathematics test scores, 10^{th} grade self-reported mathematics GPA, mathematics gain scores between 10^{th} and 12^{th} grades, and college acceptance. These analyses, provided in Chapter IV, present baseline information about who uses each form of PSI and how these populations may be different or similar.

Reasons to Use (Not to Use) PSI

What makes families decide to use private instruction? Based on the logic of human capital theory, I have proposed that there are two important groups of measures affecting the decisions by students and their parents to pursue additional educational opportunities such as PSI: educational aspirations of students and their parents, and parents' academic satisfaction with the level of education students are receiving at school. In addition to these measures, I include measures of previous

academic achievement, student and family characteristics, and school type as controls, and possible interaction effects on the relationship between aspirations, satisfaction, student characteristics, and contextual reasons (affordability and accessibility).

The output variable, whether or not a student uses advancement or remedial PSI, is binary in nature (i.e., either a student did or did not use PSI). When an outcome to be tested is dichotomous, the analytical model essentially predicts the probability of some event occurring (in this case, the probability of using PSI). Using regular linear regression methods is problematic under these circumstances because the binary nature of the dependent variable violates the assumptions of regression, potentially biasing the estimates of the standard errors and t-ratios. Moreover, predicted probabilities estimated using regular linear regression can exceed the possible range of probabilities (Menard, 1995) – that is, estimated probabilities for whether a student uses a particular form of PSI could be higher than 1 or lower than 0.

The distribution of the likelihood of an event's occurrence, when graphically expressed, is non-linear and similar to an S-shaped curve, where the estimates for the upper and lower values of the dependent variables are asymptotically bounded to a range of 0 to 1. To accommodate the non-linear function of binary dependent variables, logistic regression is used, which expresses the outcome as a linear function of a set of log odds coefficients. Coefficients expressed in log odds represent a change in the log odds of Y occurring given a one unit change in the value of X_i (an independent variable). This relationship can be expressed as:

$$\text{Odds } (Y = 1) = e^{(a + b_1 X_1 + b_2 X_2 \ldots + b_i X_i)}$$

where *e* is the base of the natural logarithm and *a* and *b* are the parameters of the linear model. The log odds have a non-linear relationship with the underlying probability of an event but can be converted into the probability that an event Y will occur given some configuration of values for the independent variables. This probability can be expressed as:

$$P \text{ (probability of an event Y will occur)} = 1 / 1 + e^{(a + b_1 X_1 + b_2 X_2 \ldots + b_i X_i)}$$

In my analysis, I use the logistic regression to see if factors related to students' and parents' educational aspirations and parents' academic satisfaction influence the probability that students and their families use PSI for advancement or remedial purposes. The array of independent variables (X_n) in the formulas above includes the possible reasons for using PSI (aspirations and satisfaction), the possible contextual effects (affordability and accessibility), as well as the control variables described in this chapter. I also include a set of possible interaction effects between educational aspirations, academic satisfaction, student characteristics, and contextual reasons (affordability and accessibility).

In conducting these logistic regressions, I build models in order of the simplest to the most complex by adding variables by conceptual categories. The first model includes only the dependent variable (use or not to use of advancement or remedial PSI) and the primary independent variables (level of aspirations or satisfaction). The second model adds variables on contextual reasons (income and geographical location), and the third model adds student characteristics, including previous achievement levels in mathematics. The fourth model adds family and school characteristics. Finally, interaction terms between primary independent variables and

control variables are added using forward step-wise procedures. These interaction terms investigate whether the effects of aspirations or satisfaction vary by gender, race, past academic performance, family income or geographical location. The findings from these analyses, along with the findings from the descriptive analyses, are presented in Chapter IV.

Effects of Using PSI

What are the possible benefits to high school students of using PSI? Human capital theory proposes that individuals invest in education hoping for higher future returns on their investment. Did students who spent time and money on PSI receive a benefit, such as higher academic achievement or a better chance of acceptance by a four-year college? Although neither outcome directly measures future earnings, each can be thought of as an intermediate benefit that enhances the likelihood of higher future earnings for students. Because each outcome requires a different method of analysis, I discuss the analysis strategy for achievement gains and college acceptance separately.

Gain in Mathematics Achievement

One of the output variables that I consider in the study is academic achievement – more specifically, the gain in scores between the 10^{th} and 12^{th} grade as measured by the difference in scores on the NELS mathematics achievement tests. Since the resulting gain variable is a continuous measure, I use an ordinary least squares (OLS) regression analysis to address those research questions that examine the effects of the use of PSI on academic achievement. In building the regression models, I include the primary independent variables (in this case, the use of either

advancement or remedial PSI), academic aspirations and satisfaction, and the array of control variables (prior achievement, student and family characteristics, and school type) described in this chapter.

The regression model for the analysis of gain scores in mathematics achievement potentially due to the use of PSI, therefore, is as follows:

$$Y_i = b_0 + b_1X_1 + b_2X_2 \ldots b_iX_i + r_i$$

where,

Y_i = achievement gains in mathematics,

b_0 = average achievement gains in mathematics,

b_1 = the effects of the use of advancement PSI on achievement gains,

b_2 = the effects of the use of remedial PSI on achievement gains,

b_i = the effects of an array of control variables (e.g., student and family characteristics and school type) and interaction variables on achievement gains, and

r_i = error or the residual effects of variables not included in the model.

As was the case of the analyses on the use of PSI, I add variables by conceptual categories, building from the simplest models to the most complex models. In the first model I include only the dependent variable (gain scores in mathematics achievement) and primary independent variables (use of advancement and use of remedial PSI). In the next models, I add student characteristics, followed by family characteristics and school type. In the final model, I include a set of interaction terms between PSI use and the control variables (gender, race, family income, and education level of parents). The findings of these analyses are presented in Chapter V.

Four-Year College Acceptance

When the research questions examine the use of different types of PSI and students' chances of college acceptance, the nature of outcome variable is dichotomous or binary. For these analyses I use logistic regression to address my research questions. Therefore, the analytical models for four-year college acceptance are similar to the analytical models presented for estimating the probability of PSI use for high school students. Recall that this model can be represented as follows:

$$P \text{ (probability of an event Y to occur)} = \quad 1 / 1 + e^{(a + b_1 X_1 + b_2 X_2 \ldots + b_i X_i)}$$

Based on this model, acceptance at a four-year college is a function of the use of PSI (advancement or remedial), student characteristics, family characteristics, and school type. Again I add variables by conceptual categories, starting with the simplest model and proceeding to the most complex model. The initial model includes the dependent variable (four-year college acceptance) and the primary independent variables (the use of advancement or remedial PSI). The second model includes variables that tap student characteristics, while the third model adds variables that measure family characteristics. In the fourth model I include school type, and in the final model I add a set of interactions to investigate whether the effects of PSI use vary by educational aspirations, academic satisfaction, gender, race, educational level of parents, and family income. As in all the models developed for this study, the interaction terms are entered using a forward step-wise procedure to reduce the potential effects of multicollinearity. The results from these analyses are presented in Chapter V.

Summary

In this chapter, I described the source of data for my analyses and the characteristics of the data that I intend to use in the study, as well as measures and analytical methods that I am planning to use to address my research questions. I use the NELS of 1988 to investigate questions about who uses PSI (advancement or remedial), and what the effects of such use are for 12th graders in the United States. The size of analytical sample is about 7,600 students who attended middle school in 1988 and graduated from high school on time in 1992.

Since the NELS data contain variables asking families about the use of advancement or remedial type PSI, as well as characteristics of students, families, and schools, it allows me to build a series of progressively more complex empirical models that consider the effects of PSI use on student achievement and college acceptance. Depending on the nature of the outcome variable, I either use OLS regression or logistic regression to investigate my research questions.

CHAPTER IV: WHO USES PSI – THE ROLE OF ASPIRATIONS AND SATISFACTION

Introduction

This chapter focuses on the findings of the analysis for the first half of my analytical model – who actually uses advancement or remedial PSI. From the perspective of human capital theory, I am particularly interested in how different levels of academic aspirations and satisfaction of parents and students contribute to the likelihood of using either advancement (SAT or ACT preparation) or remedial PSI. Before addressing those findings, I examine the descriptive data to see what characteristics both advancement and remedial PSI users actually have in general, including student characteristics (gender, race, past and present academic performance, use of supplementary instructions at school), family characteristics (income, educational background of parents) and school characteristics (types of schools).

Characteristics of Students and Families: Who Use Advancement PSI, Remedial PSI, or No PSI

Table 4.1 presents descriptive statistics of students who use advancement PSI only, students who use remedial PSI only, and students who do not use PSI at all. Here the use of advancement PSI refers to students taking a commercial test preparation course or receiving private tutoring to prepare for the SAT or ACT. The use of remedial PSI means students receiving help from private tutors to do homework, as defined in the NELS dataset.

Table 4.1 Descriptive Information of Students by Type of PSI [1]

			Used advance-ment PSI	Used remedial PSI	Did not use PSI	All students
			931	379	6,303	7,613
			12%	5%	83%	100%
Outcome Variable						
Gain scores in mathematics	*m*	**	0.10	-0.02	-0.01	0.00
Accepted by four-year colleges	%	***	62	47	47	49
Primary Independent Variable						
Aspiration						
Expects finishing college (by parents)	%	***	91	84	82	83
Expects finishing college (by students)	%	***	84	73	71	73
Satisfaction (by parents)						
Standards set by school is too low	%	NS	21	23	20	20
School places high priority on learning	%	NS	91	91	89	89
Affordability (Income)						
Family income	*m*	***	0.17	0.25	-0.04	0
Accessibility (Geographical location)	%	***				
Urban			16	5	79	100
Suburban			12	6	83	100
Rural			8	4	88	100
Control Variables						
Student Characteristics						
Prior Student Performance						
Mathematics test score (10th grade)	*m*	***	-0.05	-0.33	0.03	0.00
Mathematics GPA (10th grade) (4.0 system)	*m*	***	3.0	2.6	2.9	2.9
Gender	%	NS				
Female			49	53	51	50
Race						
White	%	***	10	5	85	100
African-American			22	5	73	100
Hispanic-American			13	4	83	100
Asian-American			18	8	74	100
Supplemental instruction at school						
Had tutor at school	%	***	88	87	82	83
Had test preparation course at school	%	***	34	20	15	17
Parents and School Characteristics						
Level of parent education	*m*	***	0.22	0.28	-0.05	0
School type	%	***				
Public			10	5	85	100
Catholic			19	4	77	100
Private			28	6	67	100

*p<0.05, **P<0.01, ***p<0.001
1: reported N = unweighted number. Figures for continuous variables are standardized (m=0, SD=1).

Columns are organized by PSI use: students who use advancement PSI, students who use remedial PSI, and students who do not use any form of PSI. Rows are organized by items (i.e., measures), starting with the two outcome variables for the second half of the analysis (mathematics achievement gains and college acceptance) followed by the primary independent variables (aspirations, satisfaction, affordability, and accessibility), and control variables (student characteristics, family characteristics, and school characteristics). On the far right of the table is the mean or percent for all students in the analytical sample for each item.

The table reports standardized mean scores (*m*) or percentages (%) for individual items. Continuous variables are all standardized means ($m = 0$, SD = 1) and can be interpreted as effect sizes, except for GPA at the 10^{th} grade, which is expressed in the traditional 4.0 GPA metric. For categorical variables with only two categories (college acceptance, aspirations, satisfaction, gender, and supplementary instruction at school), I report column percents. Variations for these items are best determined by comparing the means or percentages within a column to the mean or percentages in the total column.

I report row percents (i.e. percents that add up to 100% by row) for three measures that have multiple sub-categories: geographical location, race, and school type. For these three measures, variations are best determined by comparing the percentages in a row to the percentages for PSI users at the top of the table. For example, if 22% of African-American students use advancement PSI but the percentage of use is 12% across all racial/ethnic groups, then African-American students use advancement PSI at a greater rate than students in general.

I conducted a Chi-square test for comparisons using categorical variables, and an analysis of variance tests (one-way ANOVA) for comparisons using continuous

variables. Statistically significant Chi-squares and F-tests for ANOVA are indicated in the column preceding the columns for PSI users.

Outcome Variables

PSI Use

There are four outcomes variables for this study: use of advancement PSI, use of remedial PSI, mathematics achievement gains, and college acceptance. The top row of Table 4.1 presents the first outcome measure – that is, the distribution of students in various categories of the use of PSI. These are the dependent variables for the first half of the analysis which looks at what determines the use of PSI. Out of 7,613 students in my analytical sample, 1,310 students (17%) have used either advancement or remedial PSI – in another words, nearly one out of five students has used some form of PSI.[33] There is also a small number of students (n = 176) who used both advancement and remedial PSI, which have been excluded from the analytical sample to make the distinction of two types of PSI users clearer. Therefore, the actual number of PSI users is larger than 17%.

Mathematics Achievement Gains

Mathematics achievement gains and college acceptance are the outcome variables for the second part of my study, which examine the effects of using PSI. The achievement gains are the differences in mathematics scores between 10th and

[33] Powers and Rock (1999) who examined students who took the SAT during 1994-1995 found that 12% of the sampled students took coaching programs that were not offered by their schools, which is the same proportion for students who took advancement PSI in my data. (12%) It is possible that 12% or more or less was the approximate proportion of students who took advancement PSI in the early 1990s.

12th grades measured by the NELS study, which makes these scores comparable across grades. The achievement gain is highest for students who used advancement PSI (0.10SD) during these two years and lowest for students who used remedial PSI (-0.02SD). Students who did not use any PSI fall in the middle (-0.01SD).

College Acceptance

The rate for acceptance for four-year colleges shows a strikingly large difference between different PSI users. Sixty-two percent (62%) of advancement PSI users are accepted by four-year colleges, a rate that is much higher than the average of all students (49%). Both non-users (47%) and remedial PSI users (47%) have substantially lower college enrollment rates than those of advanced PSI users. Though unadjusted for other factors that might influence college acceptance, it seems that use of advancement PSI is strongly linked with getting access to four-year colleges.[34]

Primary Independent Variables

Aspirations and Satisfaction

Most parents and students in the analytical sample express high levels of educational aspirations – nearly three-quarters or more of those surveyed say that they wanted their children or themselves to at least graduate from college. For those who use advancement PSI, the percentages are even higher (91% of parents and 84% of students), while there is no noticeable difference in the educational aspirations of

[34] As noted in Appendix 1, the variables that I use to measure college acceptance actually measures college enrollment. Since it is quite possible that there are students who were accepted but did not enroll in colleges, the actual college acceptance is likely to be even higher than the proportions shown in Table 4.1.

remedial PSI users and non-users. Considering the aim of advancement PSI to help students improve their test scores for college entrance examinations, their elevated aspirations may not be surprising. The positive relationship between aspirations and use of advancement PSI reinforces the other findings in the literature (Powers and Rock, 1999)

On the other hand, parents of PSI users (both for remedial and advancement programs) and non-users do not differ when asked about their satisfaction with the education provided to their children at their schools, as indicated by their responses to such questions as whether or not they are satisfied with the academic standard of their school or the priority the school places on learning. Overall, only one-fifth (20%) of those surveyed think their school sets standards too low, while most (89%) thinks that their school places a high priority on learning.

Affordability and Accessibility

Private tutoring is not inexpensive, so it can be envisaged that income would influence the extent to which families would purchase such services. Not surprisingly, the analysis of descriptive data demonstrates that the average income of families who either use advancement PSI (0.17 SD) or remedial PSI (0.25 SD) is higher than the average income for non-users (-0.04 SD), the findings that are consistent with observations made by others (Gorman, 2004; Powers and Rock, 1999). It is also interesting to note that remedial PSI users report a somewhat higher income level than advancement PSI users, the difference being roughly 8% of a standard deviation (SD).

Geographical location, a possible indicator of accessibility to PSI, also varies between users and non-users of PSI. Students living in urban areas are twice as likely as students living in rural areas (16% vs. 8%) and somewhat more likely than students

in suburban areas (12%) to use advancement PSI. Students living in suburban areas are slightly more likely to use remedial PSI (6%) than students living in rural areas, and students living in rural areas are more likely to report using no PSI (88%) than urban (79%) or suburban students (83%). Theses findings may support the claims made by some observers that the accessibility to PSI (facilities) varies depending on where students reside; thus, if students live in rural areas, it may be harder to use PSI since such commercial services are often not available in rural areas (Gewertz, 2004; Gorman, 2004, Medler, 2004).[35]

Control Variables: Student Characteristics

Prior (10th grade) Academic Performance

PSI users (for both advancement and remedial forms) have on average lower level of 10th grade mathematics achievement than non-users of PSI. Between two types of PSI users, the remedial PSI users have the lowest performance (-0.33 SD) followed by the advancement PSI users (-0.05 SD) and non-users (0.03 SD). The finding that advancement PSI users had lower levels of achievement than non-users is something different from what I expected.

On the other hand, average self-reported mathematics grades (GPA) at the 10th grade are slightly higher for students who use advancement PSI (3.0 for mathematics) compared to non-users (2.9 for mathematics), and noticeably higher than students who use remedial PSI (2.6 for mathematics). GPA, however, may not be the most accurate measure to compare levels of achievement because a B-plus in school A might indicate a very different level of achievement from a B-plus in school B.

[35] M. Bray (1999) found that, in other countries, such as Cambodia, Egypt, Greece, and Taiwan, PSI is also found to be most available in urban areas.

Nonetheless I include the GPA information in my analytical model to see if low GPA can be a motivation for students to take PSI.

Race and Gender

Descriptive data show small and non-significant differences between male and female students as far as the use of PSI is concerned. However, there is considerable difference in PSI use according to racial group. All minority (non-white) student groups are more likely to use both advancement and remedial PSI than white students. While 27% of African-American students and 26% Asian-American students report that they have used some forms of PSI, only 15% of white students report such usage.

The use of advancement (SAT/ACT preparation) PSI seems to vary particularly by race: more than one-fifth of African-American students (22%) and close to one-fifth of Asian-American students (18%) said that they used advancement PSI, while only one-tenth (10%) of white students did so. The use of remedial PSI is more similar across racial groups, though Asian-American students report a slightly higher rate than other students

Use of Supplemental Instruction at School

The descriptive data show some differences between PSI users and non-users as to whether or not they have had a tutor at school – receiving tutorial help either by their teachers or students who were identified as qualified tutors by their schools. Although it appears that a large proportion of students have received tutorial support

from their schools (83%), students who use advancement PSI (88%) or remedial PSI (87%) are more likely to have received tutorial support than non-users (82%).

Moreover, students who use advancement PSI (34%) and remedial PSI (20%) are also more likely to have taken preparation courses for the SAT/ACT *at school* than students who do not use PSI (15%). Contrary to what I predicted, test preparation programs offered at school do not seem to be an alternative for private instruction for students, but to be an additional opportunity to prepare for college entrance examinations for eager students. Although the data do not indicate which came first (advancement PSI or at-school test preparation), it is possible that taking one form of test preparation encourages students to take another – a virtuous cycle in the attitude for preparation for college entrance test may at work here.

Control Variables: Family and School Characteristics

Level of Parental Education and Type of Schools

The average levels of educational attainment for parents of both PSI users are noticeably higher than that for non-users, the difference being roughly 0.27 SD for advancement PSI users and 0.33 SD for remedial PSI users. A closer look at the data indicates that more parents in the former group are college graduates or higher (46% for remedial users, 43% for advancement users, and 31% for non-users).[36] Interestingly again, parents of remedial PSI users hold higher levels of educational attainment than parents of advancement PSI users, as was the case with the income level – indicating that families of remedial PSI users tend to have higher socio-economic status.

[36] Again, Powers and Rock (1999), also found that their sampled students who took the SAT preparation courses had parents with more formal education.

Concerning school characteristics, private school and Catholic school students are more likely to take advancement PSI (28% and 19% respectively) than public schools students (10%). Private school students are also slightly more likely to take remedial PSI (6%) than Catholic schools (4%) or public schools students (5%). Public school students are the most likely to report no use of PSI (85%) followed by Catholic school students (77%) and private schools students (67%). Although a majority of students use no form of PSI, those who do are more likely to attend either a Catholic or private high school.

Use of PSI:
Role of Aspirations and Satisfaction in the Decision to Use PSI

Introduction

This section describes the results for the research questions for the first-half of the study – namely, whether factors related to students' and parents' academic educational aspirations and parents' academic satisfaction with their schools influence the probability that students and their families use PSI for remedial or advancement purposes. The research questions are:

(1) *Advancement PSI and aspirations or satisfaction*. When families and students have higher levels of educational aspirations, or when they have lower levels of academic satisfaction with their schools, are they more likely to use advancement PSI than the families who have lower levels of educational aspirations or higher levels of academic satisfaction? Do contextual factors, such as income (affordability) and geographic location (accessibility), have any effects on the decision to use advancement PSI?

(2) *Remedial PSI and aspirations or satisfaction*. When families and students have higher levels of educational aspirations, or when they have lower levels of academic satisfaction with their schools, are they more likely to use remedial PSI than the families who have lower levels of educational aspirations or higher levels of academic satisfaction? Do contextual factors, such as income (affordability) and geographic location (accessibility), have any effects on the decision to use remedial PSI?

Since the outcome variable is dichotomous (used or did not use PSI), logistic regression is used to examine the research questions described above. I present models in order of the simplest to the most complex by adding the variables by category. The first model includes only the dependent variable (used or did not use advancement or remedial PSI) and a set of primary independent variables (the level of aspirations or satisfaction). The second model includes a second set of independent variables that represent potential contextual factors for the decision to use PSI – income and geographical location. Then a set of characteristics of students, families, and schools is included as control variables in subsequent models. Finally, I include interaction terms for aspirations and satisfaction with other variables (gender, race, past academic performance, income and living locations). I use a step-wise procedure when entering the interaction terms to identify those with the strongest effects.

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Effects of Educational Aspirations and Academic Satisfaction on the Use of Advancement PSI

Table 4.2 presents results (coefficients) of a series of logistic regressions that examine the effects of educational aspirations and satisfaction on the decision to use

advancement PSI. The first column (Model 1) presents the simplest relationships between the dependent and primary independent variables (aspirations and satisfaction). The second column (Model 2) includes a second set of primary variables (affordability and accessibility). Then control variables are added for the next two columns (Model 3-4). Finally, Model 5 contains interaction terms to examine whether the effects of aspirations and satisfaction vary by student characteristics, family income, and geographical location.

Continuous variables are in a z score (standardized) metric based on the all students in the analytical sample. All other variables are binary (0 = no, 1 = yes). Because logistic regression is used, coefficients are expressed as log odds. Positive coefficients increase the probability of using advancement PSI, while negative coefficients reduce such probability. While a larger coefficient indicates a larger effect than a smaller coefficient, the magnitude of the effects is not proportionally linear (e.g. unlike regression coefficients, a log odds of 0.4 is not an effect that is twice the magnitude of a log odds of 0.2).

I discuss the effects of aspirations first followed by the effects of satisfaction. I then discuss effects associated with affordability, access, and the control variables included in the models (Models 2-4). In the final section, I consider the possibility that the effects of aspirations and satisfaction vary for different student populations (Model 5). When warranted, I present these results as probabilities rather than log odds.

Effects of Aspirations on the Use of Advancement PSI

The descriptive analysis (Table 4.1) indicates that there is a positive relationship between level of aspirations and use of advancement PSI. Does such a

Table 4.2 Aspiration or Satisfaction on Use of Advancement PSI

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Personal Reasons: Aspirations or Satisfaction		Contextual Reasons: Income or Living Location		Student Characteristics		Family and School Characteristics		Interactions with Aspiration or Satisfaction	
Level of aspiration	0.60	***	0.56	***	0.55	***	0.50	***	0.65	***
Level of satisfaction	0.08	*	0.05		0.07		0.00		0.05	
Family income			0.05		0.18	***	0.11	*	0.07	
Living in suburb			-0.30	***	-0.21	*	-0.07		-0.08	
Living in rural			-0.55	***	-0.40	***	-0.24	*	-0.24	*
Previous test score					-0.25	***	-0.27	***	-0.35	***
Previous math grade					0.10	*	0.10	*	0.08	
Female					-0.24	**	-0.21	**	-0.19	*
Asian-American					0.61	***	0.58	**	0.58	**
Hispanic-American					0.21		0.29	*	0.31	*
African-American					0.69	***	0.77	***	0.76	***
Took remedial math at school					0.36	**	0.36	**	0.37	**
Took test prep at school					0.80	***	0.83	***	0.88	***
Level of parent's education							0.09	*	0.06	
Go to Catholic school							0.52	***	0.53	***
Go to private school							0.96	***	0.79	***
Aspiration x income									0.17	***
Aspiration x pre math test									0.24	***
Satisfaction x Hispanic-American									-0.37	*
Satisfaction x African-American									-0.31	**
Constant	-2.16	***	-1.87	***	-2.48	***	-2.71	***	-2.91	***

*p<0.05, **P<0.01, ***p<0.001

relationship still exist even after other competing reasons for students to take PSI are taken into account?

In Table 4.2, the constant for each model (at the bottom of each column) represents the log odds of choosing advancement PSI for a model's reference group (students with a score of 0 on all variables in the model). For example, for Model 4, the constant a=-2.71 is the log odds of using advancement PSI for the reference group – in this case, white male students who have average aspirations and satisfaction; have average 10^{th} grade mathematics test scores and mathematics GPA; did not take remedial tutoring or test preparation courses at school; live in urban areas; have families (parents) with average incomes and education levels; and go to public schools. The coefficients in the table represent increases and decreases to the reference group in the log odds of using PSI.

As shown, aspirations are strongly and positively related to the decision to use advancement PSI regardless of control variables included in a model (P<0.001 for all models). The higher the level of educational aspirations held by parents and students, the greater the probability of students using advancement PSI. The log odds for using advancement PSI for students with low levels of aspirations (- 1 SD) is –2.76 (-2.16 + [-0.60]), whereas the log odds for students with high levels of aspirations (+1 SD) is –1.56 (-2.16 + 0.60) in Model 1. As additional variables are added to the models, the effects of aspirations reduce somewhat (from 0.56 in Model 2 to 0.50 in Model 4). Still, even after all independent and control variables are added (Model 4), higher levels of aspirations remain a positive factor in the decision to use advancement PSI. The log odds for a student with a low level of aspirations (SD = -1) is –3.21 (-2.71 + [-0.50]), whereas the log odds for a student with a high level of aspirations (SD = 1) is -2.21 (-2.71 + 0.50).

Because coefficients are expressed in log odds, it is harder to compare the magnitude of the effect changes among different groups of students since log odds are not comparable proportionally. Using Model 4, I converted the log odds into probabilities for students with low, average, and high levels of aspirations (using 1 SD as indication of high or low aspirations compared to other students). It shows that students with high aspirations are 4% more likely to take advancement PSI compared with students with average aspirations, and 6% more likely compared with students with low aspirations.

Effects of Satisfaction on the Use of Advancement PSI

If aspirations make a difference in deciding to take advancement PSI, what about satisfaction? Are parents and students who are not satisfied with their schools more likely to seek out-of-school time opportunities for learning?

Returning to Model 1 of Table 4.2, satisfaction initially has a small and positive effect on the probability of seeking advancement PSI. Parental satisfaction increases the log odds for the reference group by 0.08. When contextual factors (income and access) are considered (Model 2), however, the effect of satisfaction becomes non-significant. A closer examination reveals that adding income or living location individually does not change the significance level of the effect of satisfaction from significant to non-significant, but the combination of both does. The effect of satisfaction remains non-significant in Model 4, but there is an indication that the effect varies by student population in Model 5 (an observation that I return to later).

Effects of Affordability and Accessibility on the Use of Advancement PSI

Two elements that could influence the use of PSI, as discussed in the previous chapters, are family income and living location. The former concerns the affordability of educational services, which can be quite costly; the latter is related to accessibility to these services. Model 2 in Table 4.2 shows the possible effects of theses two factors when each is taken into account in the model.

After considering the effects of aspirations and satisfaction, income alone has no effect on the use of advancement PSI (Model 2), though location does. Both suburban and rural students are less likely to take advancement PSI than urban students. Living in suburban or rural areas reduces the likelihood of using advancement PSI by -0.30 and -0.55 log odds, respectively. The model reinforces the findings of the descriptive analyses that geographical access to PSI is a factor in taking advancement PSI.

The inclusion of student characteristics (Model 3) somewhat reduces the effect of geographical location (access) on using advancement PSI, but these factors also increase the effect of income (from 0.05 to 0.18 log odds). The increase in the effect of income with the inclusion of additional variables suggests a suppression effect (Cohen, J., Cohen, P., West, and Aiken, 2002). Such an effect may indicate a possible interaction between satisfaction and student characteristics or a relationship in which one variable "masks" the effects of another variable.

Once the model is specified with the addition of family and school characteristics (Model 4), the effects of income becomes smaller but remain statistically significant, which is consistent with other findings (Powers and Rock,1999). The difference between students living in urban and suburban areas disappears, but the difference between students living in urban and rural areas persists

(-0.24 log odds). Overall, the effects of income and location are related to the education level of parents and school type, but the former are not explained away when the latter measures are added to the model.

Other Elements That Affect Use of Advancement PSI

Models 3 and 4 in Table 4.2 also highlight the effects of other factors that can affect the likelihood of using advancement PSI. Model 3, to which student characteristics are added, shows that having had a higher mathematics test score reduces the likelihood of taking advancement PSI, an effect also shown in the descriptive analysis. Being female also decreases the likelihood that students take advancement PSI. Conversely, having a higher mathematics GPA previously, being Asian American or African American, and having received remedial tutoring or test preparation courses at school, are all likely to increase the likelihood of taking advancement PSI for students.

These effects are roughly the same in Model 4. Additional effects include having parents who attained higher levels of education themselves and going to non-public schools. In each instance, having parents with more education or attending non-public schools increases the likelihood of taking advancement PSI. There is also a slight suppression effect associated with Hispanic and African-American students, as well as having taken a test preparation course at school. In each instance, the effect increases after considering parents' education and school types. In the final model all minority-group students show a higher likelihood of taking advancement PSI than white students, which is also indicated by the descriptive analysis.

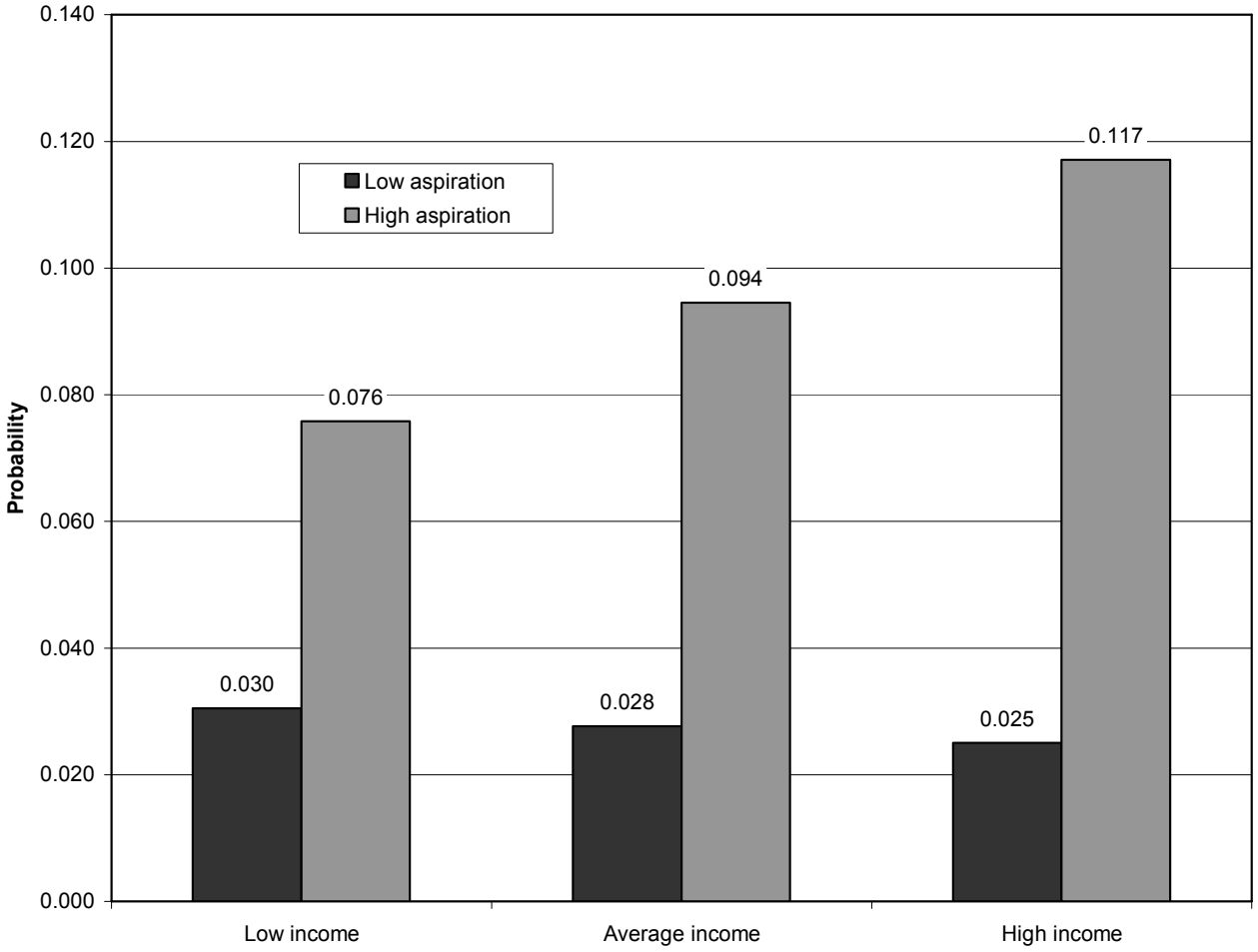
Specific Groups of Students That Aspirations or Satisfaction Affects Differently

To determine if the effects of aspirations and satisfaction are the same for different student populations, I add interaction terms for gender, race, income, geographical location, and previous academic performance in Model 5. There are four interaction terms identified as statistically significant: aspirations by income, aspirations by previous mathematics test scores, satisfaction by Hispanic-American students, and satisfaction by African-American students. In short, the likelihood of taking PSI not only depends on the level of aspirations or satisfaction but also the combination of aspirations or satisfaction and other characteristics, as described in the next subsection.

Income difference concerning aspirations and use of advancement PSI. I argued that income is a contextual factor that could influence the use of PSI. In the previous section, I noted that higher income slightly increases the log odds for students and families to decide to use advancement PSI (Model 4 in Table 4.2). However, income also appears to have a moderating effect on the relationship between aspirations and the use of advancement PSI. For example, the effect of aspirations for students from prosperous families (SD=1 for income) is 0.82 log odds (0.65+0.17), while the effect of aspirations for students from less prosperous families (SD = -1 for income) is 0.48 log odds (0.65-0.17).

Since the results in Table 4.2 are expressed in log odds, it is difficult to compare the magnitude of the combined effects of the level of aspirations and income on the decision to use advancement PSI. To facilitate the comparisons among different income groups, I present Figure 4.1 in which the same results are shown in probabilities by different groups of students. I have recalculated probabilities from

Figure 4.1 Probability of Using Advancement PSI by Students from Different Income Level and Aspiration Level

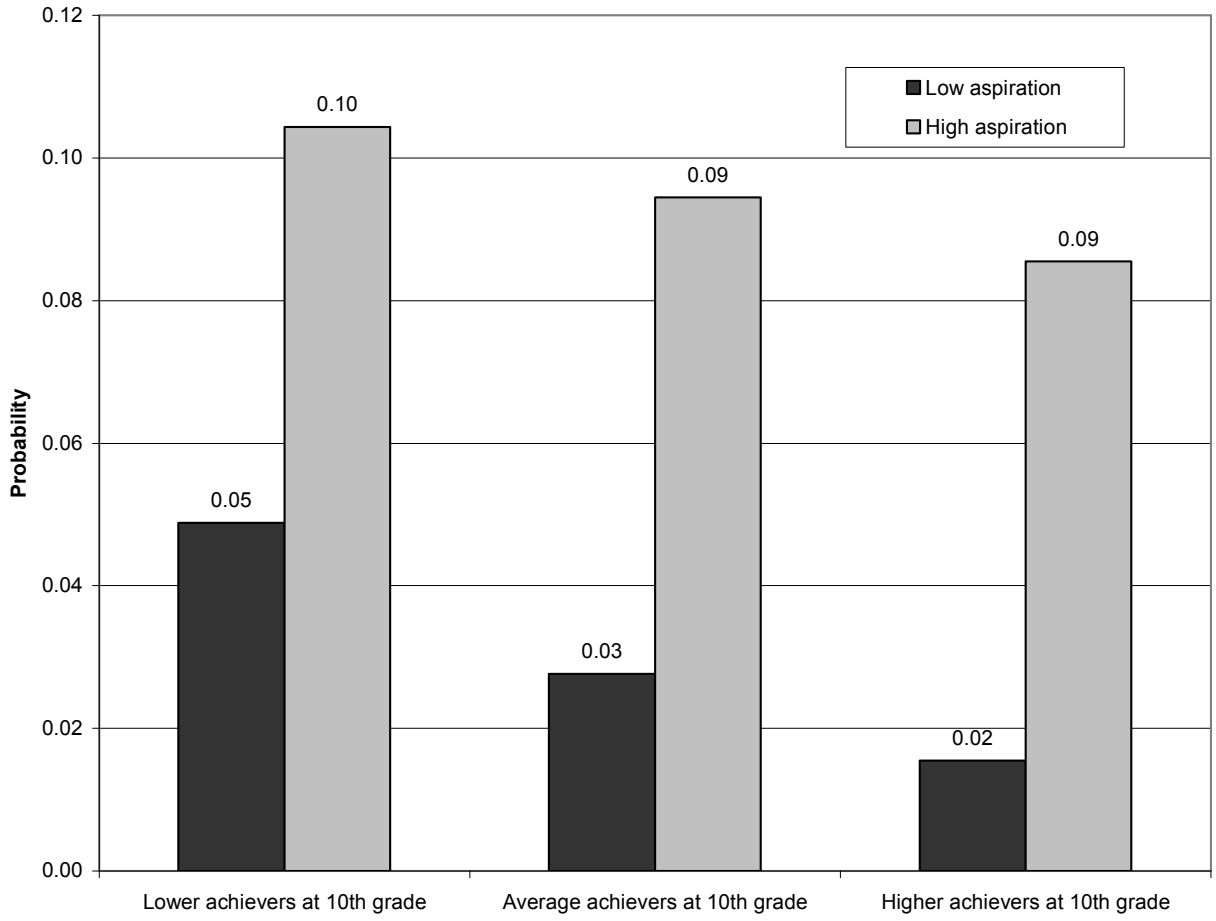


coefficients in Table 4.2. In Figure 4.1, axis Y represents the probability of using advancement PSI and axis X shows students from different income groups with different levels of aspirations. Since the measures of income and aspirations are standardized, I define high values as 1 SD above the mean and low values as 1 SD below the mean.

The probability of taking advancement PSI ranges from 0.03 to 0.12 overall (Figure 4.1). When the effect of aspirations is compared within the same income level, it becomes clear that the effect of aspirations increases more with higher levels of income. The difference in the proportions between low and high levels of aspirations is largest for high income families – that is, the greater the income available to spend on advancement PSI, the greater the effect of aspirations. While the effect of income as a single measure may not be large here, it also influences the effect of aspirations, which indicates that income level indeed matters in the decision to use advancement PSI. When students are from more prosperous families, aspirations have a greater effect on the decision to use PSI; when students are from less prosperous families, the effect of aspirations is smaller.

Previous achievement concerning aspirations and use of advancement PSI. As stated before, Model 4 (model without interaction terms) in Table 4.2 shows that students with lower levels of previous achievements (at least in terms of achievement test scores but not mathematics GPA) are more likely to take PSI to prepare for the SAT. However, the interactions in Model 4 indicate that the effect of aspirations varies with previous achievement levels. Whereas the effect of aspirations is 0.89 log

Figure 4.2 Probability of Using Advancement PSI by Students with Different Previous Achievement and Aspiration Level

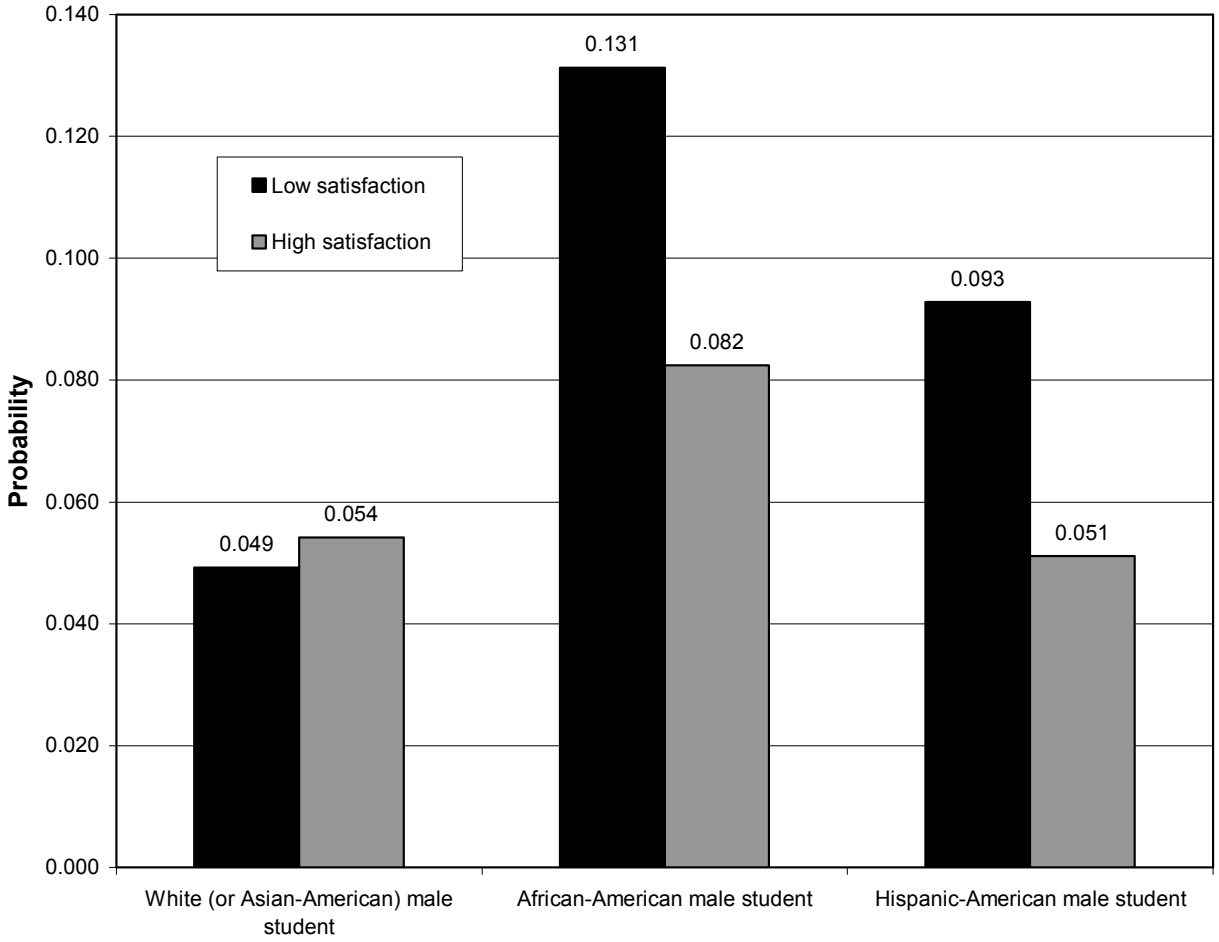


odds for high achieving students (0.65+0.24), the effect is 0.41 log odds for lower achieving students (0.65+[-0.24]). Such differences are more obvious when the log odds are converted into probabilities, as expressed in Figure 4.2. In general, aspirations push students at any level of previous achievement to take test-preparation PSI.

Nonetheless, high aspiring students with high previous test scores are 4.5 times as likely to use such PSI as non-aspired students with comparable achievement histories (0.02 vs. 0.09). On the other hand, there is less of a difference between students with high and low aspirations among low achievers (0.05 v. 0.10). Although students are more likely to take advancement PSI when they had lower level of 10^{th} grade achievement, when they are aspired, the effect of the differences by the previous achievement becomes quite small (0.10 vs. 0.90) – indicating again that how important aspirations are for the decision to use advancement PSI.

Racial differences concerning the effects of satisfaction on the use of advancement PSI. The model with all control variables (Model 4 in Table 4.2) indicates that different levels of satisfaction do not seem to affect the decision to use advancement PSI. However, a closer examination of interactions indicates that satisfaction affects students differently according to racial background. Although satisfaction has no effect on the decision of white and Asian families to use advancement PSI, it does have an effect on the decision of African-American and Hispanic-American families. Higher levels of satisfaction reduces the probability of using advancement PSI by –0.32 log odds for Hispanic-American families (0.05 + [-0.37]) and –0.26 log odds for African-American families (0.05 + [-0.31]).

Figure 4 3 Probability of Using Advancement PSI by Race and Satisfaction Level



Again I converted the log odds to probabilities and present these results in Figure 4.3 to highlight the comparisons. There are different patterns to the use of advancement PSI by different levels of satisfaction for different racial groups. For white and Asian-American students, having high or low satisfaction with school has little or no influence on the decision to take test preparation PSI. However, for African-American or Hispanic-American students, satisfaction seems to matter – when they are not satisfied with school, they are more likely to take advancement PSI (0.13 and 0.09 in probabilities respectively). This may suggest that students and families from these two racial groups are seeking educational opportunities that they think that they cannot obtain from their current schools.

Effects of Aspirations and Satisfaction on the Use of Remedial PSI

Table 4-3 shows the results of the logistic regressions that examine the effects of educational aspirations or academic satisfaction on the use of remedial PSI. I add variables by category in the same way as the models that examine advancement PSI. All the variables are either standardized or binary. As I did before, I examine the effects of aspirations first, followed by those of satisfaction. Then to determine if contextual factors (affordability and accessibility) can affect the use of remedial PSI, measures on family income and geographical location are added to the model. I also describe other factors that can encourage families to use remedial PSI, such as student, parent, and school characteristics. When warranted, I present these results as probabilities rather than log odds.

Table 4.3 Aspiration or Satisfaction on Use of Remedial PSI

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Personal Reasons: Aspirations or Satisfaction		Contextual Reasons: Income or Living Location		Student Characteristics		Family and School Characteristics		Interactions with Aspiration or Satisfaction	
Level of aspiration	0.04		-0.05		0.06		0.00		0.00	
Level of satisfaction	-0.08		-0.11	*	-0.04		-0.03		-0.03	
Family income			0.30	***	0.40	***	0.25	***	0.26	***
Living in suburb			0.07		0.10		0.06		0.04	
Living in rural			-0.24		-0.20		-0.22		-0.23	
Previous test score					-0.42	***	-0.50	***	-0.49	***
Previous math grade					-0.16	**	-0.17	**	-0.18	**
Female					0.10		0.13		0.13	
Asian-American					0.49	*	0.40		0.36	
Hispanic-American					-0.20		-0.13		-0.14	
African-American					0.00		-0.02		-0.01	
Took remedial math at school					0.38	*	0.39	*	0.38	*
Took test prep at school					0.09		0.10		0.09	
Level of parent's education							0.38	***	0.38	***
Go to Catholic school							-0.43		-0.45	
Go to private school							-0.18		-0.19	
Aspiration x African-American									-0.42	*
Aspiration x Pre math GPA									-0.18	**
Constant	-2.94	***	-2.94	***	-3.46	***	-3.47	***	-3.43	***

*p<0.05, **P<0.01, ***p<0.001

Educational Aspirations and Satisfaction on the Use of Remedial PSI

Descriptive analysis indicates no significant differences in the use of remedial PSI among families who have different levels of educational aspirations. The results of logistic analysis shown in Table 4.3 confirm that finding. After controlling for possible competing reasons to use PSI, educational aspirations of students and parents are unrelated to the decision to use remedial PSI from the simplest relationship (Model 1) to the model with all control variables (Model 4).

Academic satisfaction also stays statistically non-significant regarding the use of PSI, except when contextual factors are added (Model 2). A separate analysis shows that it is income of families that brings the effects of satisfaction to statistical significant in the slightly negative direction, which implies that a suppression factor exists between income level and academic satisfaction with regard to the use of remedial PSI.

However, when student characteristics are added to the model, the effects of satisfaction on the use of remedial PSI again become non-significant. A close examination reveals that it is previous academic performance, either previous mathematics test scores or previous mathematics GPA, that changes the significance level. In other words, it seems to be that students' past academic performance, which would be certainly related to academic satisfaction, encourages families to consider using remedial PSI. Considering the nature of "remedial" PSI the purpose of which is mainly to improve the learning and current academic standing of students, it is not surprising that poorer academic performance in the past can be a stimulus to use PSI.

Effects of Affordability and Accessibility on the Use of Remedial PSI

When the use of advancement PSI was examined earlier, both geographical location (accessibility), and to a lesser extent, income, mattered. However, analysis of the use of remedial PSI shows a set of somewhat different relationships with contextual items. On one hand, geographical location remains non-significant throughout all the models, indicating that it does not matter where families live when they take the remedial PSI. On the other hand, income level remains positively significant and related to the use of remedial PSI regardless of the kind of control variables that are added ($P< 0.001$ for all models). Unlike the use of advancement PSI, income level seems to matter in the decision to use remedial PSI no matter what level of aspirations or satisfaction families have.[37] Even when the model is specified with all control variables (Model 4), families who have higher levels of income have a higher likelihood of using remedial (roughly 0.25 log odds) PSI.

Other Elements That Affect Use of Remedial PSI

Models 3 and 4 also demonstrate that there are other elements that could influence the use of remedial PSI. For example, concerning Model 3 that includes student characteristics, having poor levels of performance previously, whether they are expressed as mathematics achievement scores or mathematics GPA, makes students more likely to take remedial PSI. This does not seem to be surprising since if students were not doing well academically, they might consider investing in extra help such as remedial PSI.

[37] Almost 10 years later, similar observation is still made by Gorman (2004) who describes that tutoring market mostly serves wealthy market.

Additionally, being Asian American and taking remedial mathematics at school are related to a higher likelihood of using remedial PSI. The effects of race, however, largely disappear after including the effects of family and school characteristics, though there are indications of interaction effects with aspirations in the final model (Model 5). Being Asian American and deciding to take remedial PSI seems to be an interesting case if I look into the profile of these students. While Asian-American students in general have the highest previous mathematics test scores on average (group mean score, m = 0.28 whereas overall mean = 0) and the highest level of average mathematics GPA (m = 0.21), Asian-American students who reported taking remedial PSI had the second to worst (after Hispanic students) previous mathematics test scores (m = -0.52) and the worst average GPA (m = -0.61). In general, it is poorly performing students who decide to take remedial PSI, and such a decision seems to be particularly the case for Asian-American students. However, the use of remedial PSI by this group of students has an interesting effect on their academic achievement, which is explained in Chapter V.

Model 4 also shows that when parents have higher levels of educational attainment themselves, their children are more likely to take remedial PSI. Together with the effect of income, it seems that parental factors, or so-called family socio-economic status, play a larger role in deciding to use remedial PSI compared with advancement PSI. Going to non-public (private) schools positively increases the probability of using advancement PSI, though there is no relationship with using remedial PSI. Overall, it is the previous performance of students and parental background (income and parents' education level) that seem to influence the decision to take remedial PSI the most.

Specific Groups of Students That Aspirations Affect Differently

As shown, aspirations or satisfaction in general do not influence the use of remedial PSI. However, a closer examination of the interaction terms in Table 4.3 reveals that there are two specific types of students that are either more or less likely to use remedial PSI when they have the different levels of aspirations (Model 5). One group is African-American students and another is students who have had different levels of 10^{th} grade mathematics GPAs.

African-American students and use of remedial PSI. For African-American students, educational aspirations seem to be somewhat negatively associated with the decision to use remedial PSI. If they are more academically aspired (SD=1 for aspirations), the likelihood of taking remedial PSI is -0.42 less in log odds. If they are less aspired (SD=-1), the log odds *increase* by 0.42. Although the differences are relatively small, in terms of probabilities (0.05 v. 0.02), African-American students may take remedial PSI or be offered opportunities to take remedial PSI for reasons other than personal aspirations.

Previous mathematics GPA and use of remedial PSI. Overall, GPA is negatively associated with the probability of using remedial PSI (-0.18 log odds). When students and families are more academically aspired, lower GPAs even more increase the probability that families use remedial PSI compared to students and families who are less aspired. Whereas the log odds for students with high GPAs in mathematics and high aspirations (1 = SD) is roughly 0.00 log odds [-0.18+ (-0.18)], the log odds for students

with low GPA and high aspirations is roughly 0.36 [(-1) (-0.18) + (-1) (-0.18)]. In sum, the interaction suggests that lower GPA may have more of a positive effect for students when they also have high aspirations than low aspirations. .

Summary

In this Chapter, I presented findings related to the use of advancement and remedial PSI – more specifically, how educational aspirations and academic satisfaction with current schools play a role for students and their families in taking out-of-school, privately-offered instruction. I started by examining descriptive data to show some of the relationships between PSI users (or non-users) with student, family, and school characteristics. Then I examined the effects of aspirations and satisfaction on the use of advancement or remedial PSI by running logistic regression models. It turns out that aspirations have strong effects on the decision to use advancement PSI, while it does not particularly influence the decision to use remedial PSI. Satisfaction with school does not seem to affect the decision to use both advancement and remedial PSI. It is important to note, however, such effects could vary considerably with student and family characteristics and backgrounds. Therefore I examined and showed that even among students with the same level of aspirations or satisfaction, the likelihood of using PSI can vary substantially by other factors, such as income level, previous academic performance, and race.

CHAPTER V: EFFECTS OF USING PSI ON MATHEMATICS ACHIEVEMENT AND COLLEGE ACCEPTANCE

Introduction

This chapter focuses on the findings of the second half of my analytical model – what are the effects of using advancement or remedial PSI on (a) gains in mathematics achievement scores and (b) increases in the probability of four-year college acceptance. Human capital theory proposes that people invest in themselves by receiving more education and training with the hopes of getting higher efficiency and productivity, and improving their wage levels. Does using PSI, which is an additional educational investment, bring more educational and market opportunities to students as predicted in the literature? I would like to test such predictions by examining the relationships between the use of PSI and academic achievement and academic attainment, each of which is measured by gain scores in mathematics achievement during high school and four-year college acceptance.

In the following sections, I examine the effects on mathematics achievement first, followed by the effects on college acceptance. In each model, I start with analyzing effects by use of advancement PSI and use of remedial PSI (Model 1). I then discuss effects associated with the addition of other variables of interest and control variables (Models 2-4). In the final section, I consider the possibility that the effects of the use of advancement or remedial PSI on achievement or college acceptance may vary for

different student populations (Model 5). When warranted, I present these results as probabilities rather than log odds.

Effects of PSI on Academic Achievement in Mathematics

This section describes results for the research questions regarding the relationships between the use of advancement PSI (SAT/ACT test preparation) or remedial PSI (homework help) and gains in student mathematics achievement. Achievement here is measured as an increase or decrease in mathematics scores between 10^{th} and 12^{th} grades, while use of PSI is measured by whether students stated that they participated in a SAT/ACT test preparation course out-of-school-time or paid for tutoring during high school. The research question, as stated in Chapter III, is:

(3) *Use of advancement or remedial PSI on mathematics achievement*. When students use advancement PSI or remedial PSI, are they more likely to improve their mathematics scores at 12^{th} grade compared with 10^{th} grade?

Since the outcome is continuous (standardized difference in mathematics test scores between 10^{th} and 12^{th} grades), I use Ordinary Least Squared (OLS) regression analyses to derive the estimates for addressing the research question. As was the case of the analyses on the use of PSI, I add the elements by conceptual categories: the first model just has the dependent (gain scores in mathematics achievement test) and the two primary independent variables (use of advancement and remedial PSI). Then variables on student, family, and school characteristics are added by step in the subsequent models.

Finally, interactions terms between primary independent variables and control variables (gender, race, income, and education level of parents) that can affect the key relationships are added using step-wise regression procedures.

Table 5.1 presents the results of regression analyses based on this process. The first column (Model 1) presents the simplest relationships between the dependent and primary independent variables. Then control variables are added for the next three columns by conceptual category (Model 2-4). Finally, Model 5 contains interaction terms to examine whether effects of taking advancement or remedial PSI vary by student and family characteristics. Continuous variables are in z score (standardized) metric based on the all students in the analytical sample. All other variables are binary (0 = no, 1 = yes).

In Table 5.1, the constant for each model (at the bottom of each column) represents the mean gain in mathematics achievement between the 10^{th} and 12^{th} grade for the model's reference group (students with a score of 0 on all variables in the model). For example, for Model 4, the constant a=0.02 is the mean achievement gain for mathematics for the reference group – in this case, white male students who have an average level of educational aspirations and academic satisfaction; have average 10^{th} grade mathematics test scores and mathematics GPA; did not take remedial tutoring or test preparation courses at school; live in urban areas; have families (parents) with average income and education levels; and go to public schools. Coefficients represent increases and decreases to the reference group in mean achievement. In the next section I examine the effects of advancement PSI first, then those of remedial PSI.

Table 5.1 Effects of Using Advancement or Remedial PSI on Mathematics Achievement

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Use of both PSI		Student Characteristics		Family Characteristics		School Characteristics		Interactions PSI and selected characteristics	
Use of ADV PSI	0.12	**	0.09	*	0.05		0.05		0.04	
Use of REM PSI	-0.01		0.00		-0.01		-0.01		-0.05	
Previous math grade			0.06	***	0.04	**	0.04	**	0.04	**
Female			-0.20	***	-0.22	***	-0.22	***	-0.22	***
Asian-American			0.14	*	0.14	*	0.15	*	0.10	
Hispanic-American			0.04		0.04		0.04		0.04	
African-American			-0.03		-0.04		-0.03		-0.02	
Took remedial math at school			0.07	*	0.05		0.05		0.05	
Took test prep at school			0.07	*	0.04		0.04		0.05	
Living in suburb					0.02		0.04		0.05	
Living in rural					-0.02		0.01		0.01	
Family income					0.01		0.01		0.00	
Level of parent's education					-0.01		-0.01		-0.01	
Academic aspiration					0.09	***	0.09	***	0.09	***
Academic satisfaction					0.03	**	0.03	*	0.03	*
Go to Catholic school							0.16	**	0.16	**
Go to private school							-0.09		-0.10	
Remedial PSI x Asian-American									0.73	**
Advancement PSI x Income									0.08	*
Constant	-0.01		0.01		0.05		0.02		0.02	

p<0.05, **P*<0.01, ****p*<0.001

Effects of Using Advancement PSI on Mathematics Achievement

Initially, the use of advancement PSI is positively related to the increase in mathematics achievement (Model 1). Students who have taken the SAT/ACT test preparation courses are likely to gain 0.12 SD in their mathematics scores at 12^{th} grade compared with those who have not taken PSI. Such positive effects last even after student characteristics are considered (Model 2), although the effect becomes somewhat weaker.

However, the positive effects of advancement PSI disappear once family characteristics, such as living location, income, level of parental education, or the level of educational aspirations or academic satisfaction, are included (Model 3). A separate analysis shows that it is educational aspirations that have removed the effect of advancement PSI. Educational aspirations and use of advancement PSI are positively correlated ($p = 0.15$) and it is not the use of advancement PSI per se, but higher educational aspirations held by families as reflected in the use of such PSI, that seem to affect the increase in mathematics achievement. In other words, educational aspirations explain away the effect of advancement PSI in the pervious models. In the final model that includes all control variables (Model 4), there is no effect of educational aspirations on mathematics achievement as well.

Effects of Using Remedial PSI on Mathematics Achievement

Unlike advancement PSI, remedial PSI does not have an effect prior to entering control variables (Model 1). The effect remains non-significant after entering control

variables as well (Models 2-4). However, there is a type of student population that seems to improve mathematics achievement by using remedial PSI: Asian American students (Model 5). I return to explain this relationship later.

Other Elements That Could Affect Mathematics Achievement

Models 2, 3, and 4 in Table 5.1 show that there are more factors that can influence increases in mathematics achievement over two years. Model 2, which includes student characteristics, shows that when students have previously higher mathematics GPAs, when they are Asian Americans, when they have received either remedial or the SAT/ACT preparation help *at* school, they are more likely to have higher gains in mathematics scores. On the other hand, female students are less likely to improve their mathematics scores. When family characteristics are added (Model 3), it shows that higher levels of both educational aspirations and academic satisfaction are associated with better mathematics achievement, explaining away the effects of *in-school* assistance. When school type is added to the model (Model 4), it indicates that going to Catholic schools compared to public schools is also likely to contribute to the increase in mathematics scores from the 10^{th} to 12^{th} grades.

Specific Groups of Students that Advancement and Remedial PSI Affect Mathematics Test Scores Differently

Finally, I add interaction terms (Model 5) to investigate if the effects of taking advancement or remedial PSI are the same for different student populations. I add

interaction terms for gender, race, income, and the level of parental education. Of these potential interactions, two interaction terms are statistically significant: use of advancement PSI by different income level, and use of remedial PSI by Asian-American students. These interactions indicate that the likelihood of improving mathematics scores not only depends on the use of advancement or remedial PSI but also on the combination of use of PSI and other student or family characteristics, as described in the following subsections.

Income differences on the use of advancement PSI and gain in mathematics achievement. In Chapter IV, I noted that higher income, when combined with higher levels of educational aspirations, seems to encourage families to use advancement PSI. Here the results of interaction terms show that income also appears to have a moderating effect on the relationship between the use of advancement PSI and mathematics achievement. Although the use of advancement PSI has no effect for students from families with average incomes (0.04 SD), the effect for students from families with high incomes (SD=1 for income) is substantially larger (0.04+0.08 = 0.12 SD) and statistically significant. The effects of advancement PSI on mathematics achievement is limited largely to students who come from more economically advantaged families. I noted in Chapter IV that the combined importance of affordability (higher income) and educational aspirations in students' use of advancement PSI. Here, it is shown that when the use of advancement PSI is combined with higher income, it can lead to higher levels of mathematics achievement. This positive linkage among educational aspirations,

income, use of advancement PSI and mathematics test scores is something that needs to be further examined.

Asian Americans on the use of remedial PSI and gain in mathematics achievement. Table 5.1 shows that remedial PSI does not have an effect no matter which control variables are added to the model. However, as shown in Model 5, if students are Asian American and have used remedial PSI, their mathematics scores are likely to increase substantially by 0.68 (-0.05+0.73) SD. The same benefit does not appear to occur for other racial/ethnic populations of students.

As noted in Chapter IV, in general, Asian-American students tend to have higher mathematics scores both at 10^{th} grade (the standardized mean score, $m = 0.28$) and 12^{th} grade ($m = 0.33$) compared with other students ($m = -0.11$ for 10^{th} grade, $m = -0.14$ for 12^{th} grade). However, Asian-American students who took remedial PSI had substantially lower mathematics achievement at 10^{th} grade ($m = -0.52$), which was even lower than other students who also took remedial PSI ($m = -0.31$). By the 12^{th} grade, however, while non-Asian-American students who took remedial PSI do not show improvement in mathematics scores ($m = -0.33$), the scores for Asian-American students with remedial PSI experience substantially improved ($m = -0.21$), which means that 0.31 SD improvement in mathematics scores over two years. While this is not in the scope of this study, it would be interesting to examine why mathematics scores of Asian-American students improve considerably more than other students after using remedial PSI. It is quite possible that the experience and expectations for this form of PSI varies substantially by racial/ethnic group.

Effects of PSI on College Acceptance

This section presents findings from the analyses on the effects of using either advancement or remedial PSI on improving the likelihood of college acceptance. Educational attainment such as college acceptance is one of the important midpoint objectives that could lead to higher wages for people who invest in themselves in ways consistent with human capital theory. Is more investment in education (use of PSI) linked with higher rates of acceptance by four-year colleges? The research question examined here is:

(4) *Use of advancement or remedial PSI on college acceptance*. When students use advancement PSI or remedial PSI, are they more likely to be accepted by four-year colleges?

I use logistic regression analyses since the outcome variable is dichotomous to address this research question. Again I add the variables to the analysis by conceptual category: the first model just has the dependent (rates of four-year college acceptance) and primary independent variables (the use of advancement or remedial PSI), and then variables on student, family, and school characteristics are added in subsequent steps. Finally, interaction variables between primary independent variables and control variables (gender, race, income, and education level of parents) are added using the step-wise procedure to see if any interactions affect the key relationships in question. Because logistic regression is used, coefficients are expressed as log odds. Positive coefficients

increase the probability of college acceptance, while negative coefficients reduce such probability.

Table 5.2 presents the results of logistic regression analyses mentioned above. I add the elements by category in the same way as the model that examines effects on mathematics achievement. All the variables are either standardized or dummy-coded. As I did before, I discuss the effects of advancement PSI first, followed by those of remedial PSI. I also describe other factors that influence the probability of college acceptance, independent of use of PSI. Finally, when warranted, I discuss more fully variation in the effects of PSI by certain types of student populations.

The first column (Model 1) presents the simplest relationships that include the average probability of acceptance and variations from the average for PSI use (advancement and remedial). Then other variables of interest and control variables are added for the next three columns by category (Model 2-4). Finally, Model 5 contains the tests for interactions. In Table 5.2, the constant for each model (at the bottom of each column) represents the log odds of college acceptance for the model's reference group (students with a score of 0 on all variables in the model). For example, in Model 4, the constant a=-0.38 is the log odds for college acceptance for the reference group: white male students who have an average level of educational aspirations and academic satisfaction; have average 10th grade mathematics test scores and mathematics GPA; did not take remedial tutoring or test preparation courses at school; live in urban areas; have families (parents) with average income and education levels; and go to public schools.

Table 5.2 Effects of Using Advancement or Remedial PSI on Four-Year College Acceptance

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Use of PSI		Student Characteristics		Family Characteristics		School Characteristics		Interactions PSI and selected characteristics	
Use of ADV PSI	0.62	***	0.70	***	0.32	**	0.30	**	0.30	**
Use of REM PSI	0.01		0.43	***	0.20		0.21		-1.26	*
Previous math test			1.10	***	0.83	***	0.83	***	0.83	***
Previous math grade			0.27	***	0.26	***	0.26	***	0.26	***
Female			0.22	***	0.08		0.09		0.09	
Asian-American			0.24		0.35	*	0.36	*	0.35	*
Hispanic-American			-0.09		-0.06		-0.04		-0.05	
African-American			0.65	***	0.44	***	0.49	***	0.46	***
Took remedial math at school			0.28	***	0.06		0.06		0.06	
Took test prep at school			0.48	***	0.23	**	0.24	**	0.24	**
Living in suburb					-0.31	***	-0.18	*	-0.17	*
Living in rural					-0.10		0.04		0.05	
Family income					0.06		0.05		0.05	
Level of parent's education					0.30	***	0.30	***	0.27	***
Academic aspiration					1.02	***	1.01	***	1.01	***
Academic satisfaction					0.12	***	0.08	*	0.08	*
Go to Catholic school							0.67	***	0.67	***
Go to private school							0.48	*	0.48	*
Remedial PSI x African-American									0.98	*
Remedial PSI x ed level for parents									0.39	**
Constant	-0.12	***	-0.66	***	-0.21	*	-0.38	***	-0.38	***

*p<0.05, **P<0.01, ***p<0.001

Effects of Using Advancement PSI on College Acceptance

As shown in Table 5.2, the use of advancement PSI remains positively related to college acceptance no matter what type of characteristics (control variables) are added to the model (Models 2-4). Although the log odds decrease when other variables are added to the model, it seems that there remains a relatively strong association between using advancement PSI and being accepted by four-year colleges. In the model with all control variables (Model 4), students who have taken advancement PSI increase the log odds for four-year college acceptance by 0.30 when everything else is held equal. If the log odds are transformed into probabilities, the probability of college acceptance for white male students who took advanced PSI is roughly 0.48 (48%) compared to the probability of 0.41 (41%) for white male students who did not.

The main purpose of advancement PSI is to help students prepare for the SAT/ACT and improve such test scores, a primary factor in decisions by college admission officers. While a positive association between advancement PSI and college acceptance might be expected, these results confirm the expectation and provide some indication of the possible benefit. Overall, it would appear that the use of advancement PSI is an effective way to increase the probability of four-year college acceptance.

If we recall the positive association between educational aspirations and the decision to use advancement PSI that is discussed in Chapter IV, there seems to be a strong positive linkage between higher level of aspirations, use of advancement PSI, and a desired post-secondary outcome – college acceptance. Such findings suggest a set of relationships consistent with human capital theory and supported by people's behavior

and consequences regarding the use of advancement PSI: people with higher aspirations invest in extra educational opportunities and, consequently, gain a desirable outcome (college acceptance) to improve their marketability and possible future earnings.

Effects of Using Remedial PSI on College Acceptance

Using remedial PSI initially has no effect on college acceptance. However, when student characteristics are taken into consideration, there is a noticeable positive effect. A separate analysis shows that it is the inclusion of previous test scores that turns the significance level for remedial PSI into a positive effect. Such a pattern may indicate a possible suppression effect associated with the use of tutoring for different purposes by lower and higher achieving students (Cohen, J., Cohen, P., West, and Aiken, 2002). However, once family characteristics are added, the effect of remedial PSI returns to non-significant. Again, another analysis reveals that educational attainment level of parents reduces the significance level to non-significant in Model 3. Therefore, it is parental effects that seem to influence college acceptance through the use of remedial PSI, rather than use of remedial PSI itself; however, there is also some indication that this effect differs for different student populations. I discuss this later.

Other Elements that Could Affect College Acceptance

Models 2, 3, and 4 in Table 5.2 show that there are other factors that could influence the likelihood of four-year college acceptance. Model 2, which includes student characteristics, shows that having better previous academic performance (either

test scores or GPA), being female or an African-American student, and having taken extra academic help at school (either in remedial or the SAT/ACT preparation courses), all contribute to increasing the probabilities of college acceptance.

When family characteristics are added (Model 3), having parents who have higher levels of academic attainment, higher levels of educational aspirations or higher levels of academic satisfaction, also positively influence the probabilities of college acceptance. Being Asian American is now positively associated with college acceptance, indicating that there may be a suppression effect here, too. On the other hand, effects of being female and of having taken remedial tutoring course at school become non-significant and their previous positive effects seem to be explained away by family characteristics. Living in suburban areas compared with urban areas also is less likely to contribute to the probability of college acceptance.

In Model 4, going to non-public schools (either Catholic or private) positively influence the probabilities of being accepted by colleges. Among all the variables, previous mathematics achievement and educational aspirations have the largest effects on the log odds of being accepted to a four-year college (0.83 and 1.01 respectively). Perhaps somewhat surprising effects are the relative advantage of African-American students (0.49) compared to white students in the probability of college acceptance and the lower probability of college acceptance for students from suburban (-0.18) versus urban locations. Although the magnitude of effects is reduced by the inclusion of other variables in the models, the effects remain statistically significant in later models.

Specific Groups of Students That Use of Remedial PSI Affects Four-year College Acceptance Differently

Lastly, I include interaction terms (Model 5) to investigate whether the effects of using advancement or remedial PSI on four-year college acceptance varies for different student populations. I add interaction terms for gender, race, income, and the level of parental education. Model 5 identifies two interaction terms as statistically significant: use of remedial PSI by parents with different levels of educational attainment, and use of remedial PSI by African-American students. In other words, the likelihood of improving chances for college acceptance depends not only on the use of remedial PSI, but also on the combination of use of PSI and other student or family characteristics, as described in the following subsections. None of the interactions with advancement PSI turns out to be statistically significant.

Education Level of Parents on the Use of Remedial PSI and College Acceptance. The interaction in Model 5 indicates that the effect of the use of remedial PSI depends, in part, on the education level of parents. The effects for students (non-African-American students given the second interaction in Model 5) from families with average educational attainment is negative (-1.26). The effect becomes even more negative for students from families whose parents have less than average educational attainment (-1 SD) but less negative for students who come from families whose parents have higher levels of educational attainment (1 SD).

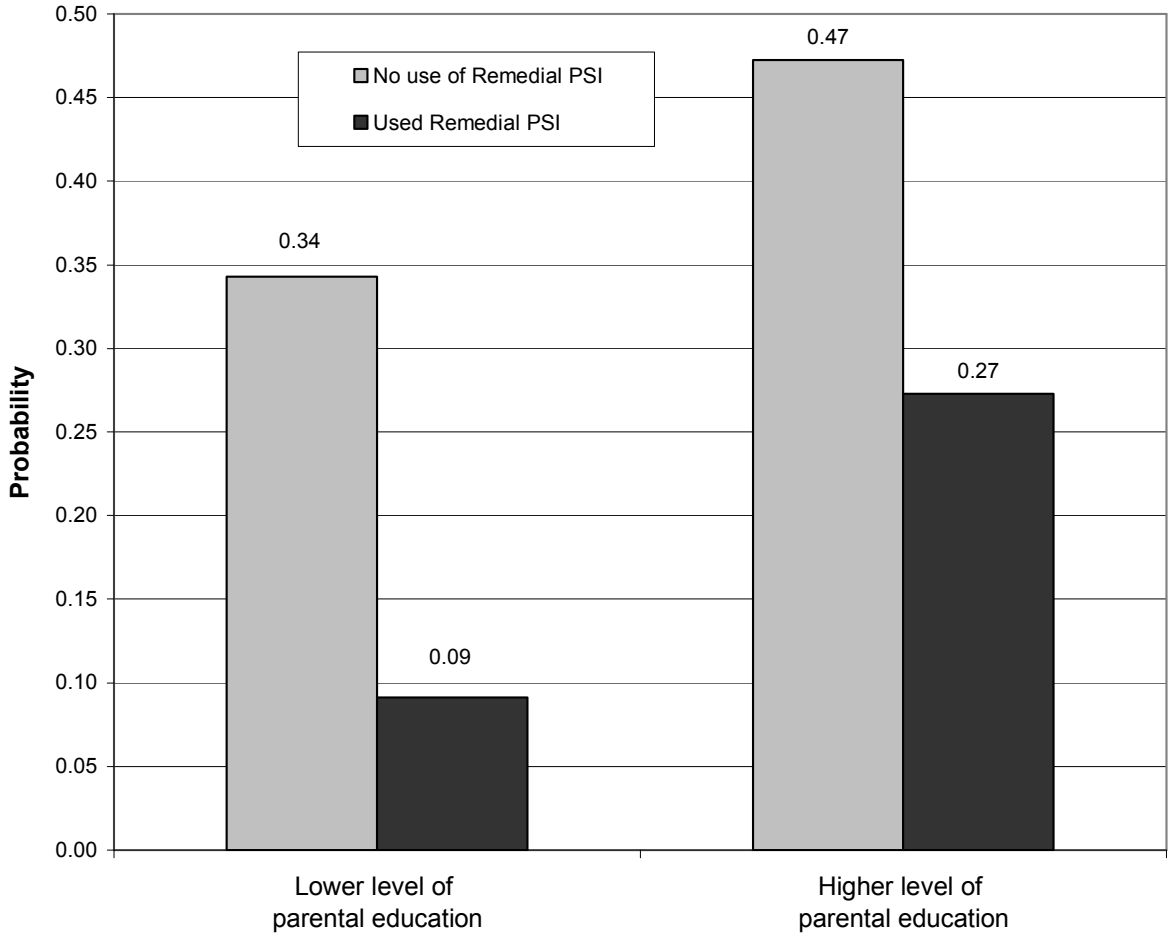
If we recall in Chapter IV where I discuss the use of PSI, the level of education for parents shows the largest positive coefficient that contributes to the decision to use

remedial PSI. The interaction that shows up in Table 5.2 suggests that not only are parents with higher levels of education more likely to use remedial PSI, but also the results of PSI use are different. Although in the final model, the association between use of remedial PSI and college acceptance is negative, parents' educational attainment mediates such a relationship.

Since results in Table 5.2 are expressed in log odds, it is difficult to compare the magnitude of the combined effects of the level of parental education and the use of remedial PSI on college acceptance. To facilitate the comparisons, I present Figure 5.1 in which the same results are shown in probabilities by different groups of students. I have recalculated probabilities from coefficients in Table 5.2. In Figure 5.1, axis Y represents the probability of college acceptance, and axis X shows students who have parents with different levels of educational attainment and have used or not used remedial PSI. Since the measure of education level for parents is standardized, I define high values as 1 SD above the mean and low values as 1 SD below the mean.

Overall, it is again confirmed that those who have not used remedial PSI have higher rate of college acceptance: from 0.34 to 0.47 (34% to 47 %), compared with the probability rates for remedial PSI users: from 0.09 to 0.27 (9% to 27%). What is most important to observe is that difference in probability rates between users and non-users varies for students with parents with lower levels of education attainment. The effect, as measured by the difference in probabilities for each set of bars, is somewhat larger for students with parents with lower levels of education (0.25) than parents with higher levels of education (0.20). Although there is insufficient data to determine why higher

Figure 5.1 Education Level of Parents on Use of Remedial PSI and College Acceptance

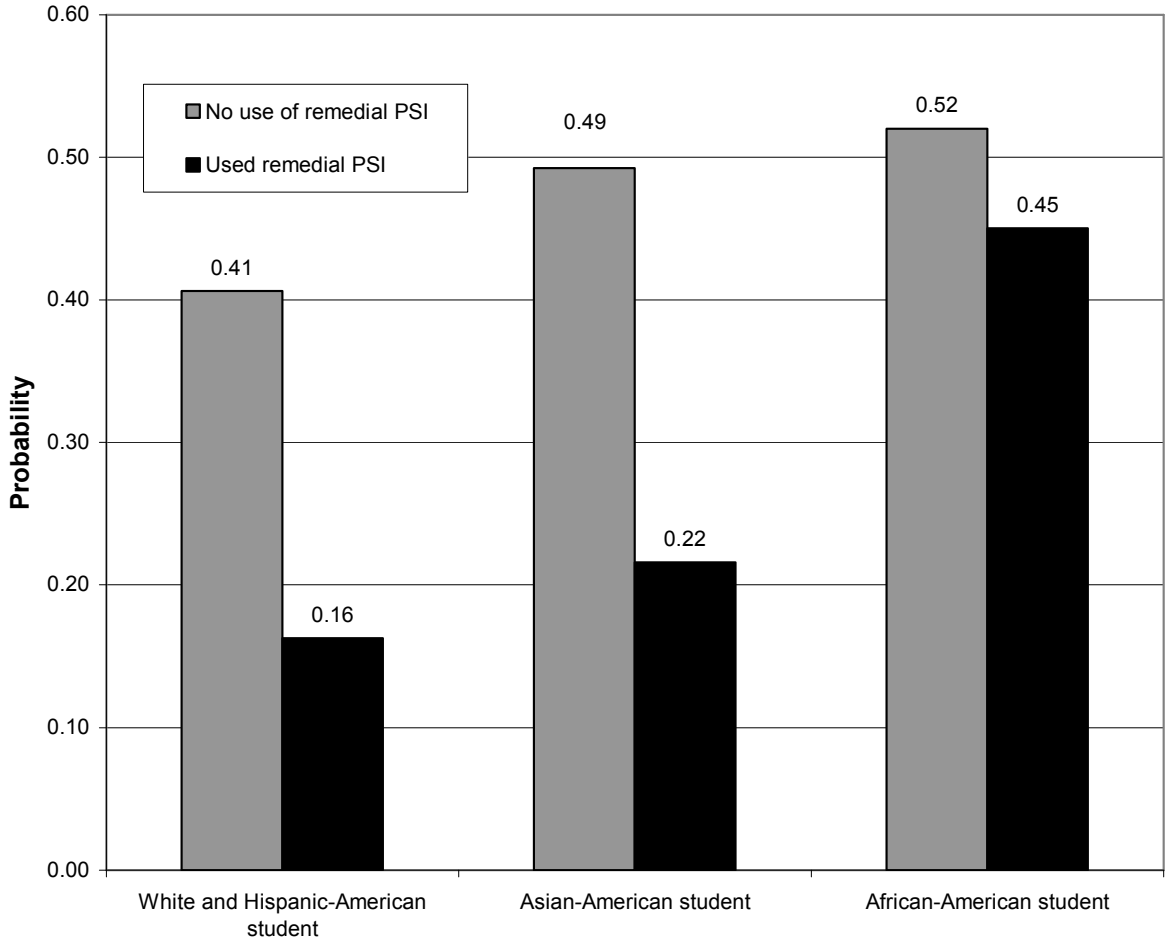


level of parents' education would reduce the magnitude of negative relationship between the use of remedial PSI and college acceptance, or, perhaps better stated, the relationship between the *underlying reasons* for seeking remedial PSI and college acceptance, it may well be that parents with higher levels of education are better able to secure tutoring services that are more beneficial for their children.

Racial differences on the effects of using remedial PSI and college acceptance. As mentioned earlier, Model 4 in Table 5.2 shows that African-American and Asian-American students are in general more likely to be accepted by four-year colleges than white or Hispanic-American students, all else being equal. However, the interaction in Model 5 also indicates that the relationship between the use of remedial PSI and college acceptance varies by race/ethnicity. Within each group of students, the likelihood for college acceptance is higher for students who did not take remedial PSI than for students who have taken such PSI. However, the differences in the log odds between PSI users and non-users are much smaller for African-American students compared to all other students. While the changes in log odds for college acceptance non-African- American students who use remedial PSI is -1.26, the log odds for African-American students is only -0.28 (-1.26+0.98).

Such differences are clearer if the log odds are expressed as probabilities (Figure 5.2). Using coefficients in Table 5.2, I converted the log odds into probabilities for white, Hispanic, or Asian-American students and African-American students who have used or have not used remedial PSI. While there is 0.25-0.27 probability gap in acceptance rates

Figure 5.2 Racial Differences on Effects of Using Remedial PSI and College Acceptance



between PSI users and non-users among non-African-American students, the gap is just 0.07 between PSI users and non-users among African-American students. Although the data for this study do not contain measures to answer the question directly, it would be interesting to see why the effect of using remedial PSI is different for African-American students compared to other students, or at least why the use of remedial PSI is less negatively associated with college acceptance among them.

Summary

In this Chapter, I presented findings related to two student outcomes: how does the use of advancement or remedial PSI affect mathematics achievement scores over two years in high school, and how does the use of advancement PSI or remedial PSI improve the probability of college acceptance? I examined the effects by the use of advancement or remedial PSI on change in mathematics achievement by running OLS regression models and examined possible variations in the effects of PSI use for students with different characteristics and backgrounds. I also examined the effects of the use of PSI on college acceptance by running logistic regression analyses.

Overall, the use of advancement or remedial PSI has no effects on improving mathematics achievement. On the other hand, use of advancement PSI has a positive effect on college acceptance, while the use of remedial PSI is negatively associated with that outcome. It is important to note, however, that such effects could vary considerably with student and family characteristics.

CHAPTER VI: DISCUSSION: FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS FOR FUTURE RESEARCH

Introduction

The intent of this study is to explore issues related to an educational phenomenon that has become increasingly visible throughout the world – PSI. To this end the study aims to propose a conceptual framework to analyze PSI, and to address two central research questions about PSI use in the United States: (a) who uses PSI and why, and (b) what are the effects of the use of PSI on student outcomes. Because PSI use is a form of investment in education, I present human capital theory as a potentially useful analytical framework for understanding this emerging phenomenon. The study does not assess the validity of human capital theory per se; rather, it assesses the utility of human capital theory as an analytical framework for examining PSI use and its consequences.

In this chapter, I summarize the findings from the analyses that I conducted to address the study's research questions concerning the use of PSI and its effects on student outcomes. I consider the extent to which human capital theory explains the findings and deepens our understanding of PSI as an emerging educational phenomenon. Then, I present key conclusions and limitations of this study. Finally, I suggest recommendations for additional research about the growth of PSI and its possible implications for education policy.

Discussion of Findings

In Chapter I, I mentioned that there could be at least two different categories of reasons that individuals (or families) might provide for using (or failing to use) PSI. One category involves personal reasons; the other category involves non-personal or contextual reasons. Among possible personal reasons, I identified educational aspirations and satisfaction with existing educational opportunities as potentially important factors. Either of these factors, I argued, could motivate individuals to invest in out-of-school-time educational opportunities, such as PSI. Among possible non-personal reasons, I identified family income and geographical access to PSI providers. Because these factors have been found to be determinates of PSI use in other studies, I included them in my models (Baker, Akiba, LeTendre, and Wiseman, 2001; Gewertz, 2004; Schwartz, 1999, Gorman, 2004; Greaney and Kellaghan, 1995; Stevenson and Baker, 1992; Medler, 2004).

Concerning the student outcomes, I investigated the effects of improvement in mathematics achievement and increases in the probability of college acceptance for two different types of PSI – advancement PSI (college entrance test preparation) and remedial PSI (private tutoring). Because I used human capital theory as the guiding theoretical framework for the study, I was interested in examining the effects of PSI use on educational outcomes that might maximize future economic earnings. In selecting these outcomes, I argued that higher levels of mathematics achievement and enrollment in a four-year, post-secondary institution are intermediary benefits that increase the probability of economic gains when students eventually enter the workforce. In the following section I summarize the findings related to advancement PSI first, followed by those related to remedial PSI.

Advancement (Test Preparation) PSI:

Positive Linkage Between Aspirations, Use of PSI and College Acceptance

The study found that higher levels of educational aspirations are positively related to the use of advancement PSI, regardless of the type of control variables that are added to the models. Aspirations have the largest coefficients of any continuous variables (see Table 4.2), even after considering the effects of prior achievement, mathematics grades, and whether students are enrolled in a SAT or ACT preparation course at school. Moreover, the effects of educational aspirations are even greater for students from higher income families and students with higher levels of prior achievement. Overall, the findings from this study indicate that educational aspirations of students and their parents are important factors in deciding to use (or not use) advancement PSI. These findings are consistent with many individual accounts about why families use advancement PSI as reported by the general media (Casey, 2000; Mullaney, 1998).

On the other hand, academic satisfaction – whether families are satisfied or not satisfied with the education their children are receiving at school – has no influence on whether white or Asian students use advancement PSI, but it does influence, albeit modestly, the use of advancement PSI by African-American and Hispanic-American students. While it is unclear why academic satisfaction should play a greater role in the decisions of African-American and Hispanic-American families than white and Asian–American families, the direction of the relationship is consistent with the analytic model presented in Figure 1.2. When students and families are not satisfied with the education

at their schools, they are more likely to seek alternatives outside of school, such as PSI, to improve their chances of academic success and possible college admission.

When the analyses shifts to considering the consequences of PSI use, there is little indication that the use of advancement PSI improves academic achievement in mathematics, a finding that is consistent with those of a majority of other studies (Baker, Akiba, LeTendre, and Wiseman, 2001; Kenny and Faunce, 2004). An exception that this study found may be for students from wealthier families, where the use of advancement PSI is associated with greater gains in mathematics (see Table 5.1). Nonetheless, even for the wealthiest families, such effects are still relatively small.

The use of advancement PSI, however, has a fairly modest though persistent influence on the probability of gaining acceptance at a four-year college, regardless of the control variables included in subsequent models (see Table 5.2). As stated in Chapter V, taking advancement PSI increases the likelihood of college acceptance by 0.3 log odds, everything else being equal. The primary purpose of advancement PSI is to help students prepare for the SAT/ACT and improve their test scores. Because higher standardized test scores are a factor in college admissions, such a positive association may not be surprising. While it is possible, if not likely, that other factors play a role in increasing the probability of college acceptance, the findings of this study suggest that use of advancement PSI can increase a student's chances of four-year college acceptance.

Human Capital Theory and Advancement PSI

One purpose of this study is to see if human capital theory can be used as a theoretical framework to explain the use of PSI and its academic consequences. The

positive linkages between educational aspirations (and non-satisfaction for some student populations), use of advancement PSI, and higher rates of four-year college acceptance seem to fit well with the notion of human capital theory. This theory states that people invest in themselves through education and training to improve their chances for better jobs and higher wages. These findings suggest that families make such investment when they use advancement PSI and that their investment increases the likelihood of desirable outcomes, particularly access to college education.

Research has shown that college education leads to higher wages (Becker, G. S., 1962; Bowen, 1977; Leslie and Brinkman, 1988; Tyler, Murnane and Levy, 1995). While this study does not include labor market outcomes such as wage differentials caused by the use of PSI, it does find a positive relationship between the use of advancement PSI and college admission, an important intermediary benefit. Therefore, it would not be too difficult to predict that students who have taken advancement PSI are also more likely to eventually become higher wage earners, although such a prediction needs to be examined more directly with future research.

Another outcome examined in the study, academic achievement in mathematics, is less influenced by the use of advancement PSI, indicating that this relationship may have less relevance from the perspective of PSI use and human capital theory (an exception may be for students from wealthier families, a possibility that I return to when I discuss the findings for contextual factors). What students learn by taking advancement PSI is less directly related to improving achievement scores than to improving the SAT/ACT scores, and, therefore, taking advancement PSI is probably an inefficient way to improve a student's mathematics achievement.

Income and Geographical Location, and Use of Advancement PSI

The study also looks at several contextual reasons – income (affordability to finance such extra instructional services) and geographical location (accessibility to the service locations) to use PSI – as possible factors in the use of PSI. Both affordability and accessibility can either encourage or discourage the use of PSI. Even families with the highest educational aspirations and the lowest levels of satisfaction with current educational opportunities may not be able to use PSI if they have insufficient funds or must travel long distances to find providers. Therefore, it is important to examine these contextual reasons in the analyses of use of advancement PSI.

Income matters (Affordability). The effects of educational aspirations, one of the most important factors identified by this study, differ for families from different income groups. Educational aspirations and income are mutually reinforcing factors. Having either a higher income or higher level of aspirations increases the likelihood that families will use advancement PSI (see Table 4.2). When students have high levels of aspirations, however, they are even more likely to use advancement PSI if they also come from families with high levels of income (see Figure 4-1). As discussed in Chapter IV, affordability may become particularly important for families with higher levels of aspirations, as these are the families most likely to seek advancement PSI. While having higher aspirations seems to matter most in the decision to use advancement PSI, having more funds to spend on such services makes it more possible for families to do so. This is not surprising since advancement PSI can be quite costly, as explained in Chapter I.

When considering possible benefits, income may also play a role in whether advancement PSI affects students' mathematics achievement (see Table 5.1). Having higher income or using advancement PSI alone does not have a significant effect on improving mathematics achievement. However, when students from high-income families use advancement PSI, there is a small gain in achievement for students. While it is unclear why the benefit is limited to students from wealthier families, it is possible that income influences the quality of advancement PSI that families can acquire for their children. Descriptions about PSI in the popular media indicate that there is large variability in types of PSI that are available in the marketplace. Since there is no regulatory system to check and maintain the quality of PSI, it would not be surprising if providers differ substantially in both the scope and quality of services that they provide to students. More expensive PSI services may provide more achievement-oriented instruction and be of a higher quality than less expensive PSI services. It is possible, therefore, that having more income not only facilitates a family's decision to use advancement PSI, but it may also facilitate a family's decision to use a higher quality PSI. Because PSI use is linked to college acceptance and potentially even achievement gains, these findings raise important equity issues since students from poor families may not be able to afford these instructional services and to acquire the benefits that student from wealthy families do.

Geographical location (Accessibility). Access to facilities providing advancement PSI does not seem to influence PSI use once all the control variables are included (Model 4), except for students who live in rural areas compared to students who

live in urban areas. Although these data do not provide explicit information about the location of the nearest service provider, students who live in rural areas may have less access to advancement PSI than students who live in more populated areas. Accessibility may be less of an issue in future studies, though, because technological advancements and market developments have expanded the provision of PSI through online services since these data were collected (Bray, H., 2006).

Other Findings on Use or Effects of Advancement PSI

In addition to personal (aspirations and satisfaction) and contextual (income and geographical access) factors, the study identified other factors that influence the decision to use advancement PSI – namely, racial background and past academic achievement. While these findings are not incompatible with human capital theory or other findings of the study, the effects of these factors were not anticipated and worth further examination..

Use of advancement PSI by race. There are some interesting observations about the use of advancement PSI and students' racial backgrounds (see Table 4.2). First, non-white (African-American, Hispanic-American, and Asian-American) students are more likely to use such extra educational services than white students. Of these three groups, African-American students are the most likely to report using advancement PSI, followed by Asian-American and Hispanic-American students. Second, and as noted earlier, satisfaction with education only plays a role in the decision to use advancement PSI for African-American and Hispanic-American students. When these families express

dissatisfaction with the education provided at their schools, they are more likely to seek alternatives educational opportunities outside of their schools.

There are few studies that address the use of PSI among U.S. students, and most of those studies that do exist do not address differences in the use or effects of PSI by race extensively. Providers do not publish data on the use of their services by race. Therefore, it is difficult to examine why minority students are more likely to use test preparation PSI than white students. There are a few probable explanations, though. One possibility is there were community-level efforts to push the level of educational achievement and attainment of minority children.[38] For example, the "test wiseness" movement that occurred around the same time that the NCES conducted the NELS survey (Brazziel, 1988; Mimms, 1988). The movement encouraged explicit instruction in test taking for minority students, especially African-American students, as a policy for overcoming the achievement gap and differences between minority students and white students in educational attainment. NAACP has also been helping minority students receive post-secondary education.

Another possible reason, partly related to the first one, is that students from different racial backgrounds may use advancement PSI for different reasons. These differences may suggest cultural differences in the way specific racial groups perceive educational opportunities and the merits of personal investments in human capital. White families, for example, may feel more optimistic about their future educational and occupational opportunities and see less of a need to enhance their socio-cultural

[38] As discussed in Chapter I, benefits of educational investments in people can be enjoyed not only by individuals but also by the community to which the individuals belong (Cohn and Geske, 1990). From that viewpoint, the community has an interest in encouraging and helping its members invest in education.

advantages. Minority families, on the other hand, may be less optimistic and see greater merit in enhancing their future educational and occupation opportunities through PSI use. This might be particularly the case when African-American and Hispanic-American families are not satisfied with education at their regular schools.

A final possibility has to do with the nature of the NELS sample itself and the analytic models used to examine PSI use. Students in the analytic sample include only students who graduated *on time* from high school in 1992. In other words, the minority students in this study are a relatively academically advantaged group of minority students, especially compared to African-American and Hispanic-American students in general. Given the focus on increasing minority enrollment in post-secondary institutions during this period of time, it is possible that these students received additional encouragement from service providers, teachers, family members, and college admissions officers to seek a college education. Such encouragement could have created greater interests among minority students and their families to invest in advancement PSI.

Previous performance and use of advancement PSI. Another interesting observation is the negative association between students' past performance and use of advancement PSI (see Table 4.2). Students who performed less well on the NELS mathematics achievement test in the 10^{th} grade are more likely to take advancement PSI later. Why are lower achieving students more likely to take advancement PSI than higher achieving students? Although the data do not permit a full understanding of the phenomenon, there are a few possible explanations. Higher achieving students may not feel the needs to get extra support since they already feel confident with their testing

skills and academic preparation, while lower achieving students who want to attend college may really feel the need to do so. Additionally, because African-American students and Hispanic-American students have lower achievement scores in the sample but are more likely to take advancement PSI than white students, the mean achievement of PSI users will be lower than the mean achievement of non-users. In other words, the relationship may be partially explained by the strong association between racial background and the use of advancement PSI.

Remedial PSI – No General Effects for Both Use and Effects

Concerning remedial PSI, the study found that in general, neither educational aspirations nor satisfaction affects a family's decision to use remedial PSI (see Table 4.3). Two possible exceptions are African-American students and students with higher prior grades in mathematics. In the former case, African-American students with higher levels of educational aspirations are *less likely* to use remedial PSI. In the latter case, students with higher levels of educational aspirations are *more likely* to use remedial PSI when they also had previously lower GPAs. In either case, the linkage between aspirations and the use of remedial PSI (private help for homework) is clearly different from the linkage between aspirations and the use of advancement PSI (private help to prepare for college entrance examinations).

On the outcome side, the use of remedial PSI has no effect on improving the mathematics achievement scores of most students, though Asian-American students who used remedial PSI have greater achievement gains in mathematics than other students who used remedial PSI (see Table 5.1). The relationship between use of remedial PSI

and college acceptance is more complex. For most students, having used remedial PSI is negatively associated with college acceptance. It might be the case that students who had to take remedial PSI had also other obstacles for learning so that the use of remedial PSI did not help them enough to improve the chances for college acceptance. However, the negative effects of PSI use are substantially smaller for African-American students and also reduced by parents' with higher levels of education (see Table 5.2).

Human Capital Theory and Remedial PSI

Generally speaking, human capital theory does not explain well the behaviors related to the use of remedial PSI and its effects. Educational aspirations do not influence the use of remedial PSI for most students, and there is no clear evidence that investments in remedial PSI increase either mathematics achievement or the likelihood of attending college. There are exceptions, but this is the general pattern.

There are several possibilities why these findings differ from those reported for advancement PSI. It could be because the use of remedial PSI, unlike advancement PSI, holds less relevance to the notion of a long-term investment, a core concept in building human capital. The objective of taking remedial PSI is not as directly linked as advancement PSI with the purpose of gaining college acceptance, so the benefits associated with using remedial PSI may be more immediate and limited for families (e.g., simply helping students complete their homework). Such a conclusion is at least partially supported by the absence of a strong relationship between educational aspirations and the use of remedial PSI for most students.

Additionally, students who take remedial PSI are often substantially lower achievers than students who do not take remedial PSI. Descriptive analysis (Table 4.1) shows that previous academic performance, both in terms of mathematics achievement and mathematics GPA in 10^{th} grade, is considerably lower for remedial PSI users than non-users of PSI or advancement PSI users. Therefore, while the desire to raise achievement may motivate families to use remedial PSI, the use of remedial PSI itself might not be sufficient to improve mathematics achievement or increase the likelihood of college acceptance, especially for the lowest achievers.

Although the findings for remedial PSI are not supportive, at least in general, of a human capital framework, such a framework may still be warranted for consideration. It is still possible, for example, that some families think that improving current grades is the first step in enabling their children to go to good colleges and get good jobs – a rationale compatible with human capital theory. The study found that students whose parents had higher levels of education are more likely to use remedial PSI (see Table 4.3) and that the negative effects of using remedial PSI on college acceptance are weaker for these students than for students whose parents have lower levels of education (see Tables 5.2). Moreover, among all remedial PSI users, Asian-American students who use remedial PSI do have greater gains in mathematics achievement than other students (see Table 5.1). Additional examinations of these relationships may help to reveal under what circumstances families invest in remedial tutoring in a manner consistent with human capital theory.

Income, Geographical Location, and Use of Remedial PSI

As with advancement PSI, the study also looked at income (affordability) and geographical location (accessibility) as possible factors in the use of remedial PSI. The results, as detailed below, are somewhat different from those found for advancement PSI. While the effects of income on the use of advancement PSI operate through educational aspirations, the effects of income on the use of remedial PSI are direct and independent of other variables. Moreover, location appears to be slightly more important as a factor in determining the use of advancement PSI than the use of remedial PSI.

Income (Affordability). How does family income affect the use of remedial PSI? Income seems to be a major determinant in who uses remedial PSI. Higher income families are more likely to use remedial PSI regardless of the variables included in the models (see Table 4.3). The effect is modest but statistically significant even after controlling for the level of education of parents and prior achievement of students. Descriptive analysis also found that the average income of remedial PSI users is higher than the income for advancement PSI users or non-users of PSI (see Table 4.1). Although income played a role in the use of advancement PSI, the effect was largely limited to students from families with higher levels of educational aspirations.

Geographical location (Accessibility). On the other hand, geographical location remains non-significant throughout all the models, indicating that it does not matter where families live in gaining access to remedial PSI (see Table 4.3). It may be the case

that providers of advancement PSI face different market forces than providers of remedial PSI. The former, as shown in Chapter I, consists of larger center-based institutions while the latter can be provided by small neighborhood-based operations run by families or individuals. Thus, remedial PSI facilities may be more accessible to families living in non-urban areas, whereas advancement PSI appears to be more accessible in urban areas compared to rural areas.

Other Findings on Use or Effects of Remedial PSI

Although neither educational aspirations nor satisfaction explains why families decide to use remedial PSI, other factors do seem to play a role in the decision to do so. Family background factors are directly associated with the decision to use remedial PSI (e.g., income and the level of parental education), and, lower levels of achievement appear to prompt the use of remedial PSI as well.

Additionally, even though the use of remedial PSI does not seem to increase mathematics achievement or the probability of being accepted at a four-year, post-secondary institution for most students, specific student populations may benefit from using remedial PSI. There is evidence that Asian-American students who used remedial PSI have greater gains in mathematics achievement than other students who also used remedial PSI. Moreover, using remedial PSI is less negatively associated with college acceptance for African-American students and students with parents with higher levels of education.

Effects of family background. The level of educational attainment by parents has one of the largest coefficients (0.38) regarding the decision to use of remedial PSI (see Table 4.3). When considered along with the effects of the level of family income (0.26), family background plays an important role in such decisions. Although family background also influences the use and benefits of advancement PSI, the linkages to advancement PSI are either smaller or contingent on other factors (e.g., educational aspirations).

The educational level of parents also affects the relationship between the use of remedial PSI and the likelihood of college acceptance. Generally speaking, students who do not use (or do not need to use) remedial PSI have substantially higher chances of attending a four-year college than students who use remedial PSI. However, the difference in probability is much smaller when parents have higher levels of education and much larger when parents have lower levels of education (see Figure 5.1). While it is unclear why the level of parental education mediates the relationship between remedial PSI and college acceptance, it is possible that remedial tutoring boosts the chances of college attendance for students with more educated parents.

One possibility is that more highly educated parents are better able to increase the quality of tutoring provided to their children. Some researchers have observed that parents who are more educated tend to have higher expectations for their children and are more inclined to use private tutors to help their children do well in school (Bray, M., and Kwok, 2003). As mentioned earlier, these parents may use remedial PSI not only to resolve current academic difficulties but to also improve future chances for college acceptance. If so, parents may be willing to make greater investments in remedial

tutoring, increasing the frequency and quality of tutoring for their children. While such investments may not fully eliminate the consequences of the academic difficulties that students experience, they may reduce the negative effects of such difficulties on college admission. In other words, there may be instances in which the use of remedial PSI can be viewed as a form of human capital investment. However, additional research is required to isolate the effects of remedial PSI on college admission from the other things that highly educated parents may do to increase the likelihood of college acceptance for their children.

Effects of past academic performance. Students with lower levels of prior academic performance are more likely to use both forms of PSI, though the effects of prior performance are somewhat stronger for remedial PSI than they are for advancement PSI. However, in the analysis of who uses remedial PSI, the effects of prior grades are limited to students with higher levels of education aspirations – that is, prior grades have very little influence on whether students with lower levels of educational aspirations use remedial PSI. Because grades are the primary indicator that parents have about how well their children are doing in school, this finding suggests that parents are more likely to invest in remedial tutoring if they place a higher value on educational attainment and there is an indication that their children are having academic difficulty in school. Such an interpretation would seem to fit well with the human capital framework used by this study.

Effects of racial background. There is also evidence that the use and consequences of remedial PSI vary by students' racial backgrounds. These differences may represent socio-cultural differences in perceptions of remedial PSI and actual experiences with remedial PSI. These differences involve the effects of educational aspirations for African-American students and the consequences of PSI use on college acceptance; and the effects of remedial PSI on achievement gains in mathematics for Asian-American students.

African American, use of remedial PSI, and college acceptance. Educational aspirations do not affect the decision to use remedial PSI for most students, but they do affect the decision to use remedial PSI for African-American students (see Table 4.3). African-American students with higher levels of educational aspirations are *less likely* to use remedial PSI while African-American students with lower levels of aspirations are *more likely* to do so. Moreover, similar to moderating effects of the level of parental education, the difference in the rates of college acceptance for students who use remedial PSI and students who do not is smaller for African-American students than it is for students from other racial groups (see Figure 5-2).

These findings are difficult to explain. Especially perplexing is why African-American students with lower levels of educational aspirations use remedial PSI more often than African-American students with higher levels of educational aspirations. As stated before, there are few studies of PSI use in the United States, and among those studies that exist even fewer examine differences in patterns of use or consequences by race. Nonetheless, these findings suggest that socio-cultural factors may play an

important role in determining investments and the consequences of investments. African-American families with high levels of educational aspirations may view remedial tutoring differently or have alternative forms of assistance than other families with similar educational aspirations. Higher rates of college acceptance for African American students who do use remedial PSI may also reflect the influence of broader social movements, such as test-wiseness and affirmative action, designed to encourage college attendance by African-American students (Brazziel, 1988; Mimms, 1988). Additional research is required to more fully investigate these possibilities.

Asian American, use of remedial PSI, and mathematics achievement. Asian-American students are another student population that seems to benefit from using remedial PSI (see Table 5.1). But the positive effect identified by the study is not for college acceptance but for gains in mathematics achievement scores. As described in Chapter V, Asian Americans who use remedial PSI have relatively low levels of achievement in the 10^{th} grade, but show the greatest gains in mathematics scores two years later. It might be the case that the quality of remedial PSI used by Asian-American students is different from the quality of remedial PSI used by other students, or that Asian-American families may also have higher expectation for remedial tutoring than other families so that they can make better use of the services. Unfortunately, the NELS data do not provide sufficient information about PSI use by different racial groups to more fully explore these possible explanations.

Conclusions

In this section, I highlight six conclusions based on what I consider to be the findings of the study and my assessment of the methods and analytical framework used in the study.

The study provides important insights about PSI use, its consequences, and methodological strategies that might be used to more fully understand such use and effects of PSI. As the use of PSI becomes more prevalent in the United States, stimulated in part by federal policies like the NCLB act, there is a need for more research about this education phenomenon. This study aims to establish some fundamental knowledge about two forms of PSI – advancement PSI and remedial PSI – and present an analytical framework to guide future research. It also aims to provide a historical baseline about the use and consequences of PSI use in the 1990s, so that any future studies on this important subject have a basis for comparison. Based on the findings of this study, six conclusions can be drawn: three from major findings and three from the framework and methodologies used in the study.

Key Findings and Possible Implications

Use and Effects of Advancement PSI

First, this study has demonstrated empirically what others have argued anecdotally: families with higher levels of educational aspirations are more likely to use advancement PSI and doing so improves students' chance of college acceptance. The study also found some evidence that advancement PSI may improve the academic performance of students, particularly students from high-income families. This study

does not demonstrate that academic coaching (use of advancement PSI) raises college admission test scores (e.g., scores for the SAT or ACT), so it does not resolve the debate between the College Board or ETS and private testing centers such as Kaplan and Princeton. The study does confirm, however, a positive relationship between PSI use and college acceptance. Moreover, the study also found that students who used advancement PSI are on average lower achieving compared to students who do not use PSI, yet these students still appeared to improve their chance for college acceptance. A possible implication of this finding is that students with higher levels of educational aspirations but lower levels of achievement may be especially likely to invest in advancement PSI as a way to increase their chances of college acceptance.

Use and Effects of Remedial PSI

Second, decisions to use remedial PSI and its effects seem to be more complex. While higher educational aspirations in general do not matter, they do influence the decisions of students when they are lower achievers or African-Americans. Other factors that influence the decision to use remedial PSI are family background (parents with higher levels of education and/or higher incomes). Yet there is very little evidence that the use of remedial PSI improves academic performance or the likelihood of college acceptance for most students.

Effects of Income and Equity Implications

Third, the study found that family income has a positive and sometimes indirect effect on both the use of PSI and the benefits of such use. Students from higher-income

families are better able to afford both advancement PSI and remedial PSI, and these services are linked to desirable student outcomes. Most importantly, students who took advancement PSI are also more likely to be accepted by four-year colleges. Consequently, the importance of income in determining the use and consequences of PSI could have serious equity implications, since students from poorer families may not be able to afford such instructional services and therefore cannot receive the same benefits that students from wealthier families do. The positive linkages between family wealth, use of advancement PSI, and increased likelihood of college acceptance found by this study warrant further investigation, especially since the use of advancement PSI has increased since the NELS survey used for this study was conducted.

Methodology and Analytical Approach

Framework of Human Capital Theory and PSI

Fourth, the study has shown that the framework of human capital theory seems to be a useful tool for understanding why people use PSI, particularly advancement PSI. Students and families who invest in advancement PSI have higher educational aspirations, and their investments seem to pay off – that is, students who use advancement PSI have higher probabilities of gaining access to a four-year college than students who do not use advancement PSI. Moreover, African-American and Hispanic-American students are also more likely to use advancement PSI if they are dissatisfied with their current educational experiences, presumably to improve their chances of college admission. Such actions fit well with a human capital perspective.

Needs for Additional Analytical Perspectives

Fifth, applying the framework of human capital theory to the PSI phenomenon, however, is not sufficient to understand the use and effects of such educational services, especially differences in use and effects by race. All non-white students are more likely to use advancement PSI than white students; African-American students with lower levels of educational aspirations are more likely to use remedial PSI than their more highly aspiring counterparts. Asian-American students are more likely to improve mathematics achievement by the use of remedial PSI; and African-American students may increase their chances for college acceptance by taking remedial PSI compared to students of other races who took remedial PSI. As critics of human capital theory argue (Cohn and Geske, 1990; Marginson, 1993), the analytical framework of human capital theory employs economic theory-based perspectives that often overlook the social and cultural sides of human behaviors. Incorporating socio-cultural perspectives into investigations of PSI use would deepen our understanding of the reasons for these racial differences.

Distinctions between Types of PSI

Sixth, treating advancement and remedial PSI as separate forms of supplementary instruction turns out to be very useful, since, as shown in this study, they are very different in terms of both user profiles and effects on student outcomes. Although this study provides a systematic comparison of these two types of PSI, other distinctions might also be useful. For example, the NELS survey data do not permit any investigation of variability in the quality of PSI services, yet this variability is likely to influence both

the use of PSI and its consequences. A basic implication of this study's findings is that PSI services vary in important but not well- understood ways. Understanding this variability better will help to inform future research and policy about PSI use in the United States.

Limitations of the Study

I identify and discuss briefly four critical limitations of the study. Two limitations involve the theoretical framework that guided the study and two involve the data used to address the study's research questions. I briefly discuss each next.

Limitation of Methodologies

First, an economic models based on human capital theory seems to be a promising but not sufficient approach to understanding the PSI phenomenon in the United States. The use of PSI and its effects on student outcomes appear to be more complex than the explanations offered by a strictly economic model. Other theoretical perspectives, such as those based on social and cultural theories, need to be included in the analytical framework to account for individual behaviors and experiences (Perna, 2000), including differences between racial groups in PSI use and consequences.

Second, this study may not be a full analysis of PSI use from a human capital perspective, since it does not follow students to determine whether investments in PSI lead to higher wages and economic gains. Rather, the aim of this study is to provide both an analytical framework and a methodological approach to analyze educational issues related to the use and effects of PSI in the United States. A comprehensive investigation

of the usefulness of a human capital perspective would require more information about how PSI use influences future earnings.

Data Limitations

As stated in Chapter III, the data used for this study have two important limitations. First, the data used in this study were collected between 1992 and 1994, roughly 13-15 years ago. Because these data do not reflect more recent educational developments, such as the implementation of new policies that promote public support for PSI use and the growth in PSI providers, the findings of this study may not be generalizable to current high school students and their families.

One way of assessing the possible generalizability of these data is to compare the study's results to results from a more recent national dataset, the Education Longitudinal Study (ELS): 2002. Although the ELS dataset does not provide information about a number of key variables used in this study (e.g., the use of remedial PSI or college acceptance), it does provide general information from which to construct a user profile of high school students who *have used or plan to use* advancement PSI in the future (ELS does not distinguish between these two groups of students).

Table 6.1 compares high school seniors who reported using advancement PSI in the NELS (1992) and high school seniors who reported either using or planning to use advancement PSI in ELS (2004). Twice as many students reported using advancement PSI in 2004, although an unknown proportion of this increase represents students who have not actually used advancement PSI but plan to do so in the future. PSI users in 2004

Table 6.1 Advancement PSI Users in NELS (1992) and ELS (2004)

		Used advancement PSI	
		ELS	NELS
Number [*1]		8,601	7,613
Number of advancement PSI users		2,098	931
% of advancement PSI users		(24%)	(12%)
Aspiration	col %		
Expects finishing college or more (by parents)		96	91
Expects finishing college or more (by students)		92	84
Income (Affordability)			
Family income	*M*	0.06	0.17
Accessibility			
Location of living	col %		
Urban		35	34
Suburban		52	42
Rural		14	24
Student Characteristics			
Gender			
Male	col %	43	51
Female		57	49
Race	col %		
White		60	66
African-American		20	19
Hispanic-American		13	9
Asian-American		7	6
Parental Characteristics			
Level of parental education	*M*	0.18	0.22
School Characteristics			
School type	col %		
Public		85	80
Catholic		8	11
Private		7	9
Prior Student Performance			
Mathematics test score (10th grade)	*M*	-0.13	-0.05
Current Student Performance			
Mathematics test sore (12th grade)	*M*	-0.13	0.00

1: reported N = unweighted number.
Figures for continuous variables are standardized mean (*m*=0, SD=1).
Percentages are all column %.

also appear to include more families with higher levels of educational aspirations, more students from suburban areas, more female students and more students from public schools. Interestingly, advancement PSI users in 2004 also appear to include greater proportions of students from lower income families, parents with lower levels of education, non-white students, and lower achieving students.

Clearly, there are some differences between the NELS profile and the ELS profile of advancement PSI users. Although these profiles are not dramatically different, differences suggest an expansion of PSI use between 1992 and 2004 and an even greater tendency for these services to be used by minority students and lower-achieving students. While these differences urge caution in generalizing the results of this study too broadly, they also confirm some of the basic findings about the use of advancement PSI by this study, such as a greater likelihood for minority students and lower achieving students to use such services. Therefore, even though the generalizability of the data used by the current study may be limited, the data still appear to provide a useful historical benchmark from which to consider current patterns of PSI use.

Second, another shortcoming of the data used for this study is that it lacks some key quantitative and qualitative information on PSI services, such as duration and intensity of the use of PSI, and any information that might help to evaluate the quality of PSI services received by families. The addition of this information would have permitted the development of more fine-grained variables and a fuller investigation of relationships identified by the study.

Third, given the limitations of the data used, there is a possibility that different findings could have been reached had there been different data available. For any kind of

analysis, model specification plays an important role to determine outcomes, but one can never fulfill the requirements for complete model specifications (Klees, 1994). While I have successfully identified important variables, such as measures of aspiration, satisfaction, and use of advancement PSI, the inclusion of other variables, such as measures of the quality of PSI or more fine-grained measure on the use of remedial PSI would have made the findings of the study even more reliable.

Implications of Findings in the Current Policy Context - NCLB

This study points out some important implications for current education policy with which public money under the scheme of NCLB Act is provided to allow students from failing schools to use PSI. Such considerations become particularly important if we ever consider the expansion of the financial assistance for the use of PSI to high school students. There are at least four points that need to be mentioned.

First, financial assistance can potentially improve access to both remedial and advancement PSI for families with disadvantaged backgrounds. This study found that affordability is an important contributing factor in the decision to use remedial PSI, and to a lesser extent, advancement PSI. If families of students from failing schools have fewer resources, such as lower income or lower levels of parental education, financial support through federal policies like the NCLB, if properly administered, can encourage them to use PSI.

Second, the financial assistance provision, such as the one in the NCLB, can particularly promote the use of advancement PSI among minority students. This study found that advancement PSI is used eagerly by minority students. This is even more so

when African-American and Hispanic-American students are not satisfied with the quality of education at their schools.

Third, the quality of PSI can vary to the extent that different programs can bring different benefits to users. The study found that students can obtain higher levels of mathematics achievement by using advancement PSI when they are from wealthier families. A possible explanation for this would be that more expensive PSI is also higher quality PSI, and can be more effective in raising achievement. Even without examining the relationship among family wealth, use of PSI and its results, Tables 1.1 and 1.2 show how diverse types of PSI programs can be. If the government subsidizes the use of PSI, the quality of PSI should meet the rigorous standard that satisfies the needs of students. While different types of PSI may be needed for different students, the quality of PSI should not vary considerably among students who receive public financial assistance.

Fourth, the effects of using remedial PSI on improving learning is still unclear, and we need more information about the types of programs that work best for populations targeted by the policy. This is especially important since this study found variability in the effectiveness of using remedial PSI on student learning depending on the types of students (e.g., Asian-American students).

Suggestions for Future Research

This study highlights the need for future research in seven areas: (1) conduct a follow-up survey at the national level that provides more detailed information about PSI use, experiences and consequences; (2) carry out qualitative evaluations of PSI experience, (3) analyze more fully the equity issues associated with the use of PSI and its

effects on student outcomes; (4) examine the use and effects of PSI from social and cultural perspectives in addition to an economic perspective; (5) explore the possible community-level investments in education for children in the community; (6) expand the scope of the analysis to consider PSI and the privatization movement in public education; and (7) study PSI use and its effects in other countries to help predict the future of PSI in the United States.

Collection of New Dataset

As discussed in the preceding section on limitations, there is no recent dataset that would permit a comparable analysis of PSI use and benefits. The NELS is still the most comprehensive dataset but it is 15 years old and does not reflect more recent policies and social developments, such as NCLB and an expansion in PSI use and providers. The NCES should consider developing nationally representative surveys with questions for students and parents about PSI experiences. These questions should provide more detailed information about PSI use than those provided by the NELS, including how often and how long do students use PSI, at what ages do students use PSI, why do students and their parents decide to use PSI, and what do students and parents think about the quality of PSI services they receive from providers. Questions can also ask families who did not use PSI to provide information about why they decided not to do so, such as whether financial or logistical issues influenced their decisions or whether they viewed PSI as unnecessary. The distinction between remedial and advancement PSI should be maintained in surveys, and questions that might help develop a more comprehensive description of PSI services should be included. Such a dataset would enable researchers

to investigate more fully the effects of PSI, using more up-to-date data. These more detailed quantitative measures and key qualitative measures on PSI will be important sets of control variables in the model that I suggested in Figure 1.2. The interactions of these measures and independent variables should also be examined. These data could provide researchers, practitioners, and policymakers with more useful information about PSI use and its potential consequences for different student populations.

Qualitative Study on PSI

Data derived from a nationally representative survey are a useful resource in understanding the overall picture and trend of a phenomenon. They are particularly helpful for an exploratory study, such as this one, that aims to shed light on issues that have not been addressed nationally. However, compared to the educational services that students receive at schools, which are in principle guided and regulated, the PSI industry is not monitored and its services are likely to be more diverse than services provided to students as part of their normal school programs. Addressing these differences, many of which involve differences in quality, is not easy using datasets collected at the national level since specific details about services are lost in the generalization and aggregation of survey data.

It would be interesting to conduct qualitative, case-specific and in-depth studies to explore detailed aspects of PSI services, including differences in the quality of PSI and experience by students. For example, as this study has shown, the use of advancement PSI improved students' mathematics achievement but only for students who came from wealthier families. Why? Does the quality of PSI services depend on cost? The study

also found that when Asian-American students took remedial PSI, they improved mathematics achievement substantially more than non-Asian students who also received remedial PSI. Why? Was the type or quality of remedial PSI that Asian-American families chose different from others? How about now?

Such qualitative analyses become even more important since the use of PSI continues to be growing, most likely along with the diversity of services offered by providers. It would be interesting to see what students are learning when they take different forms of PSI, since PSI services may vary broadly in the extent to which they emphasize test-taking strategies, content knowledge, critical thinking, or some combination of these instructional goals (Schwartz, 1999).

Equity Implications

The study showed that students from wealthier families are more likely to use advancement PSI and that the use of PSI is likely to increase the chances of attending a four-year college. The study also found an increase in mathematics achievement for students who use advancement PSI but only for students from higher-income families. Both findings suggest that affordability can be an important factor in not only being able to use PSI but in being able to realize its benefits. Advancement PSI can be an expensive investment for families, and many parents, whose children might benefit from such services, may not be able to buy it. Even when lower-income families can afford advancement PSI, they may not be able to afford the quality of services that will lead to the benefits realized by more prosperous families. As human capital theory predicts and many studies indicate, college education is linked with higher wages and long-lasting

economic gains. The effects of income on the use of PSI appear to have equity implications that need to be more fully examined.

Social and Cultural Perspectives and Differences by Race

While I attempted to adopt human capital perspective in analyzing the use and effects of PSI, this study indicated that there are other factors that come into play. Critics of human capital theory argue that people do not make purely rational decisions as many economic theories predict; rather, non-economic factors, such as social and cultural factors, play a role in the decisions that people make about educational investments (Cohn and Geske, 1990; Marginson, 1993). For example, a Japanese study found that students are willing to go to PSI centers not only to increase their chances of obtaining valued economic goods but also to enrich their social life (e.g. their school friends also go there or they make new friends at PSI facilities) (Komiyama, 1993). Similarly, in the United States, there is evidence that students feel pressure to use tutoring when their friends use tutoring (Carr, 2004).

Examining PSI from social and cultural perspectives may also help to highlight some of the racial differences in use and consequences identified by this study. Why are non-white students more likely to use PSI than white students? Why are African-American and Hispanic-American families influenced more by satisfaction with their schools than white and Asian-American families? Why do Asian-American students receive greater benefits in mathematics achievement from remedial tutoring than other students or why do African-American students who use remedial PSI increase their probability of attending college compared to other students who use remedial PSI?

Examining the cultural and social factors associated with PSI use may help answer these questions and shed light on why racial background makes a difference in the use and effects of PSI.

Community Involvement in PSI from Human Capita Perspective

While social and cultural perspectives would be useful approaches to examine racial differences concerning PSI use and its effects, human capital framework might still provide an explanation if a perspective on community investment is taken into account, which is not covered by this study. As discussed in Chapter I, benefits of educational investments in people are accrued not only for individuals who invest themselves but also for the community, and eventually, the nation, to which they belong (Cohn and Geske, 1990). As the use of PSI increases and its benefits seem to occur as this study has shown, will the community commit an investment in its members by supporting students to use PSI?

Indeed NAACP, which has been helping minority students receive post-secondary education, also has been working with the Princeton Review, one of the prominent companies that offers SAT preparation courses to students (Keels, 2004). If we recall Chapter IV, this study has found that minority students, particularly African-American students, were most likely to use advancement PSI. Does propensity to support members of the community to get PSI vary by community? While this study was not thoroughly able to explain why minority students surveyed for1992 NELS data were more likely to become consumers of PSI (and they still are, according to 2004 ELS data) than white

students, examining such community investment may shed a light on such racial differences in the use of PSI, and possibility its effects on student outcomes.

PSI and the Role of Private Sector in Education

There has been debate on the expanding role of the private sector in public education. The Bush administration has encouraged a greater role played for the private sector in many industries, and education is no exception. Vouchers, school choice, and school management by private entities are good examples that have been debated between advocates and critics of the privatization movement in U.S. education.

With the increased use of PSI, particularly as a form adopted by the NCLB, the presence of private firms in public education becomes even larger and more evident. Therefore, the use and effects of PSI in the context of the overall trend toward privatization of U.S. public education would be an interesting topic for further studies.

Predictions on Use and Effects of PSI in the United States – Using Experience Abroad as a Reference

As described in Chapter II, the use of PSI is even more widespread in other countries, especially in Asian countries. What would happen if the use of PSI in the United States continues to grow? Within the current political climate, which places a strong emphasis on improving achievement by raising standardized test scores, it is not hard to predict that more pressure will be placed on individual students to "do better" on

these tests, which can drive them even more to seek out-of-school-time learning opportunities such as PSI.

Looking at other countries where PSI is already in very high demand and supply is one way to predict the implications of expanded PSI use in the United States, both at the individual and society levels. Although countries may differ in many ways, including in the structure of their education systems, both individuals and societies seem to be driven by values supported by human capital thinking where the use of PSI is widely accepted.

As the use of PSI becomes almost ubiquitous in such countries, however, serious equity concerns emerge for those who cannot afford it, for example, in Japan (Nogami, 2007). In the mean time, there are also concerns that excessive use of PSI can rob students of time with their families and opportunities to experience other valuable activities (Ihlwan, 2000). If the use of PSI keeps growing among American students, will families face similar equity issues, or the dilemma of how to allocate valuable student time among competing needs? It would be interesting to learn about experiences of PSI in other countries, as this may offer clues about the expanded use of PSI in the United States in the future.

Summary

In this final chapter of my study, I summarized the findings for the two research questions at the core of my study: (a) who uses advancement PSI and what are the effects of its use, and (b) who uses remedial PSI and what are the effects of its use. In doing so I also considered the usefulness of human capital theory in investigating and explaining

why individuals use various forms of PSI and the consequences of such use. Then I elaborated on the key findings of the study.

The most important accomplishment of this study is that it has shown empirically what the popular media has been reporting: people use PSI (especially advancement PSI) with hope of improving their educational opportunities, including improving the probability of college attendance. I argued that a human capital perspective explains well many aspects of the PSI phenomenon, particularly those aspects associated with the use of advancement PSI. At the same tine, the study demonstrates that issues related to PSI use appear to be more complex and cannot be explained by just economic factors. It also shows that there is a need for a more comprehensive analytical approach that includes social and cultural factors.

In my conclusion, I discussed some of the major limitations of the study and suggested areas for additional research. Since the use of PSI is still growing, not only in the United States but worldwide, greater attention must be paid to this phenomenon. This is especially true now, when educational and political attention is drawn to the growths and comparison on the levels of academic achievements, both domestically and internationally, such as assessment required by NCLB or international comparative assessments. As this study has shown, the use of PSI possibly brings additional benefits to many students, potentially greater levels of academic performance and increased probabilities of attending four-year colleges. Such benefits can have life-long consequences for students. This study is meant to be an initial step toward better understanding of the important educational phenomenon in the United States – the use and effects of PSI among American students.

Appendix 1: Description of Variables Used in the Study

OUTCOME VARIABLES

Gain scores in Mathematics
Gain score is calculated using the differences between 10th and 12th grade IRT achievement scores measured by NELS. It is a continuous measure and the standardized version is used (m = 0, SD =1).

NELS Variable	Description	Respondents
F11XMIRR	Mathematics IRT-estimated number that 10th grade student got right	n/a
F22XMIRR	Mathematics IRT-estimated number that 12th grade student got right	n/a

College Acceptance
A dummy-coded measure whose cut-off point is for students who are accepted by four-year colleges (yes=1, no=0).

NELS Variable	Description	Respondents
PSEFIRTY	Type of post-secondary institution with the earliest enrollment	Student (2 yrs after high sch graduation)

PRIMARY INDEPENDENT VARIABLES

Use of Private Supplementary Instruction (PSI)

Use of Remedial PSI
A dummy-coded measure (yes=1, no=0).

NELS Variable	Description	Respondents
F2S26B	If student used an individual outside a school who charges a fee to help him or her with homework during the last two years.	12th grade student

Use of Advancement PSI
The variable is made as yes=1 if respondent answers yes to either one of the following two variables. A dummy-coded measure (yes=1, no=0).

NELS Variable	Description	Respondents
F2S45B	If student took a course offered by a commercial test preparation service to prepare for SAT/ACT.	12th grade student
F2S45C	If student received private one-on-one tutoring to prepare for SAT/ACT.	12th grade student

Personal Reasons to Use Private Supplementary Instruction (PSI)

Educational Aspiration
A composite variable by factor analysis is made using the following 7 variables. It is a continuous measure and the standardized version is used (m = 0, SD =1). Also used as a control variable for analyses that examine the effects of PSI on student outcomes.

NELS Variable	Description	Respondents
F2S43	How far in school you think you will get	12th grade student
F2S99E	Discussed plans and preparation for the ACT/SAT test with parents	12th grade student
F2S99F	Discussed applying to college or other school with parents after high school	12th grade student
F2P49E	Discussed with teen on plans and preparations for ACT/SAT	Parent of 12th grade student
F2P49F	Discussed with teen applying to colleges or other schools after high school	Parent of 12th grade student
F2P61	How far in school you want your teenager to go	Parent of 12th grade student
F2P63	How often you have talked to teen about applying to postsecondary institutions after high school	Parent of 12th grade student

Academic Satisfaction
A composite variable by factor analysis is made using the following 5 variables. Variables with asterisk are reverse-coded. It is a continuous measure and the standardized version is used (m = 0, SD =1). Also used as a control variable for analyses that examine the effects of PSI on student outcomes.

NELS Variable	Description	Respondents
F2P42A*	School places high priority on learning	Parent of 12th grade student
F2P42B*	Homework assigned is worthwhile	Parent of 12th grade student
F2P42F	Academic standards set by the school are too low	Parent of 12th grade student
F2P42G*	School is preparing students adequately for further schooling after high school	Parent of 12th grade student
F2P42K*	teaching is good	Parent of 12th grade student

Contextual Reasons to Use Private Supplementary Instruction (PSI)

Affordability (Income)
Income measure is a continuous measure and the standardized version is used (m = 0, SD =1). Also used as a control variable for analyses that examine the effects of PSI on student outcomes.

NELS Variable	Description	Respondents
F2P74	Total gross family income in 1991	Parent of 12th grade student

Accessibility (Geographical Location)
Three dummy-coded variables (whether students' schools are located in urban, suburban, and rural areas) are made (yes=1, no=0, to each category) using G12URBN3. Also used as a control variable for analyses that examine the effects of PSI on student outcomes.

NELS Variable	Description	Respondents
G12URBN3	Urbanicity of the area in which the sample member's second follow-up school is located.	12thgrade student

CONTROL VARIABLES

Previous Student Performance

10th Grade Mathematics Achievement and Mathematics GPA
Previous academic performance variables are 10th grade mathematics test scores (measured by NELS) and 10th grade mathematics GPA (reported by students). They are continuous measures and the standardized version is used (m = 0, SD =1), although 4.0 system for GPA is used for descriptive analysis.

NELS Variable	Description	Respondents
F1S39A	Mathematics grade (GPA) responded by student	12th grade student
F11XMIRR	Mathematics IRT-estimated number that 10th grade student got right	n/a

Other Student Attributes

Sex, Race, Supplementary Instruction (Remedial and Advancement) at School
Sex is dummy-coded (yes = 1, no = 0). Five dummy-coded variables (whether students are white, African American, Hispanic American, Asian American) are made (yes=1, no=0 to each category) using F3RACE. Measure of whether students have taken remedial courses are made using two variables, F2S26A and F2S26C (students get 1 when they responded yes to either one of them), and then this measure is dummy-coded (yes=1, no=0). Measure of whether students have taken test preparation courses in school is made using F2S45A (dummy-coded).

NELS Variable	Description	Respondents
F3SEX	Student gender (white, African American, Hispanic American, or Asian American)	Student (2 yrs after high sch graduation)
F3RACE	Student race (male or female)	Student (2 yrs after high sch graduation)
F2S26A	A teacher at school helped you about your homework	12th grade student
F2S26C	A peer tutor, such as a student who is identified by school as a qualified tutor helped you about your homework	12th grade student
F2S45A	Took a special course at high school to prepare for SAT/ACT	12th grade student

Parents and School Attributes

Level of Parental Education, Type of School
Parental level of education is continuous measure and the standardized version is used (m = 0, SD =1). Three dummy-coded variables (whether students go to public, Catholic or private school) are made (yes=1, no=0 to each category) using G12CTRL1.

NELS Variable	Description	Respondents
F2PARED	Parent's highest education level attained.	Parent of 12th grade student
G12CTRL1	School classification reported by school	High school

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